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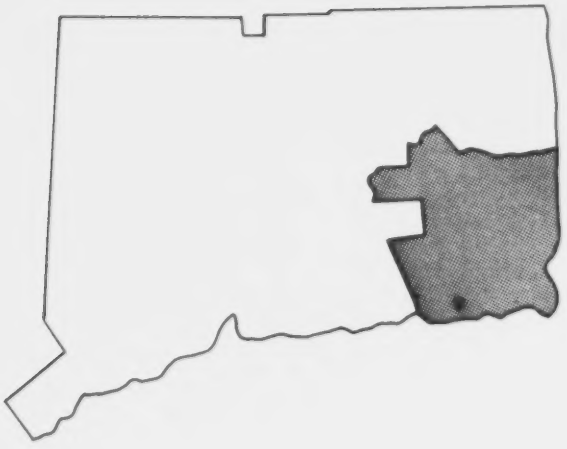
FLOOD INSURANCE STUDY

TOWN OF EAST LYME, CONNECTICUT
NEW LONDON COUNTY



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PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index

Flood Insurance Rate Map

FLOOD INSURANCE STUDY
TOWN OF EAST LYME, CONNECTICUT

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of East Lyme, New London County, Connecticut, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert East Lyme to the regular program of flood insurance by the Federal Insurance Administration (FIA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these federally-supported studies are based. These criteria take precedence over the minimum federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 24 CFR, 1910.1(d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by James P. Purcell Associates, Inc., for the Federal Insurance Administration, under Contract No. H-4561. This work, which was completed in March 1979, covered all significant flooding sources in the Town of East Lyme.

1.3 Coordination

Contacts were made and meetings were held with the first selectmen, and other town officials and residents. The initial Consultation and Coordination Officer's (CCO) meeting was held on June 6, 1977, and the intermediate CCO meeting was held on January 16, 1979. At these meetings, the tidal and riverine flooding and drainage problems

were described and discussed. Streams to be studied in detail were identified and it was confirmed that a detailed study would be made of coastal flooding. Information concerning potential development along streams and on the coast was provided by the first selectmen and the town engineer. Maps and survey data were also provided. The decision was made to use the road map of East Lyme, provided by the town engineer, as the base map for this study. Mapping and survey data were obtained through contacts made with the Connecticut Department of Transportation (CONNDOT).

During the course of the work, specific information on peak discharge-frequency relationships, previous flood hazard evaluations, recent and impending flood plain development, and the extent of historical flooding was obtained, reviewed and discussed with town officials, members of the CONNDOT and local residents.

On October 30, 1979, results of the study were reviewed at the final CCO meeting, which was attended by representatives of the Town of East Lyme, the FIA, and the study contractor.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of East Lyme, New London County, Connecticut. The area of study is shown on the Vicinity Map (Figure 1).

Flooding from Long Island Sound was studied from the western to the eastern corporate limits by detailed methods. Flooding along the Fourmile River, the Pattagansett River, Latimer Brook, and the Niantic River was also studied in detail. Specifically, the Fourmile River was studied from Long Island Sound to just upstream State Route 51, a distance of 3.63 miles. The Pattagansett River was studied from Long Island Sound to Pattagansett Lake, a distance of 5.7 miles. Latimer Brook was studied from the Niantic River to a point approximately 2,800 feet above Darrow Pond, a distance of 4.17 miles. The Niantic River was studied from Niantic Bay to Golden Spur, a distance of 3.6 miles. Flooding on the Niantic River was found to be tidally influenced by Long Island Sound. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction for the next five years, through March 1984.

Portions of Latimer Brook, the Fourmile River, the Pattagansett River, Beaver Brook, Beaver Dam Brook, Bride Brook, Cranberry

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

APPROXIMATE SCALE
5,700 0 5,700 11,400 17,100 FEET

VICINITY MAP

Meadow Brook and Red Brook were studied by approximate methods. Approximate methods of analysis were used to study those areas having low development potential and minimal flood hazards as identified at the initiation of the study. The scope and methods of study were proposed to and agreed upon by the FIA.

2.2 Community Description

The Town of East Lyme, which is located in southwestern New London County on Long Island Sound in eastern Connecticut, has a population of 11,399, an increase of 4,617 over the 1960 census (Reference 1). The Town of East Lyme is a rural residential community, but because of its location on the coast and its shoreline beaches, it is also a summer resort community. In addition to boat marinas, sport fishing and allied resort industries, the other principal industries are machine companies, electronic manufacturing, warehousing, and the bleaching of textiles (Reference 1).

East Lyme is bordered to the west by Old Lyme and Lyme and to the north by Salem. The Fourmile River forms half of the southern corporate limits with Old Lyme. The eastern corporate limits are shared with Waterford in the south, and Montville, north of Waterford. Approximately one-half of the boundary with Waterford lies in the Niantic River and Niantic Bay, which is on Long Island Sound.

Several concentrations of residential development exist along the shorelines of Long Island Sound, Niantic Bay and the Niantic River. The vast majority of structures are residential, although a few commercial structures are located along these shorelines. Many of the structures are within the coastal flood plains. A state park occupies approximately a third of the Long Island Sound shoreline.

The town has many rivers and brooks, some of which flow to Long Island Sound and the Niantic River. The Niantic River is a relatively large tidal waterbody forming the eastern boundary of East Lyme. At least 10 lakes or ponds are located in East Lyme. Along the Pattagansett River, Latimer Brook, the Niantic River and the Fourmile River, are a significant number of residential and commercial structures. Gorton and Dodge Ponds and Pattagansett Lake also have a significant number of residential structures located along their perimeters.

A very large part of East Lyme is public property. Rocky Neck State Park, Stone Ranch Military Reservation (Connecticut National Guard),

the State Military Camp, Nehantic State Forest and the State Farm for Women are located in East Lyme.

The geology and topography of the town are very similar to that of all southeastern Connecticut. The town's land area is quite hilly. Many small hills rise to elevations greater than 250 feet and several are over 300 feet. Bedrock is predominant and underlies the entire area at various elevations with numerous outcroppings. Glacial deposits over bedrock are primarily of two types: non-stratified material or till composed of clay, sand, gravel and boulders, intermingled; and stratified material composed of sand and gravel. These glacial deposits and the erosion of these deposits by running water from glacial melt has created an irregular earth surface. The result is numerous streams, valleys, hills, steep slopes, inland wetlands, lakes, ponds, and bedrock outcroppings (Reference 2).

Outside the populated areas, the vegetation is composed primarily of trees and undergrowth in woodlands, grasses in the open fields and pastures, farm crops in the few fields devoted to agriculture, and various swamp plants in the inland wetlands. Woodlands predominate, especially on slopes and summits of the many hills. In the woodlands, hardwoods far outstrip the softwoods in numbers.

Extensive tidal marshes have been formed naturally along the Fourmile and Pattagansett Rivers and Bride Brook which flow into the sound. Very little encroachment upon these marshes has occurred. Beyond the tidal influence, the town has extensive natural development of inland wetlands on these same streams and at many locations throughout the town.

The mean annual temperature in East Lyme is 50 degrees Fahrenheit (°F). Generally, summer temperatures are in the 70s and 80s (°F) with occasional excursions into the 90s (°F). Temperatures over 100°F, do occur, but infrequently. Winter temperatures range, for the most part, between 10°F and 40°F. For occasional short periods, temperatures will range from -10°F to 10°F. Lower temperatures do occur, but very infrequently and for relatively short periods. The prevailing winds are northwesterly in the winter and southwesterly in the summer. Hurricanes occur most frequently during the months of August, September and October. Average annual precipitation is 45 inches.

2.3 Principal Flood Problems

The most severe flooding in East Lyme occurs during hurricanes or coastal storms. These storms, with their intense winds and rainfall, can create abnormally high tidal surges, wave runup and peak runoff. When the hurricane's storm track is west of the community, the hurricane's counterclockwise winds tend to increase the adverse effect of the tidal surge. Hurricanes normally occur in late summer or early fall, but may occur in any season. When coastal storms occur in winter and spring, the flooding problem is compounded by ice jams and runoff from melting snow.

Reports of flooding in eastern Connecticut extend back to the early 17th century. Records indicate that the hurricanes of 1635 and 1638 caused extensive tidal flooding in coastal areas of Massachusetts and Rhode Island, probably the greatest ever experienced in New England during the past 340 years. Though no records exist for Connecticut, it is reasonable to assume that these hurricanes also caused extensive tidal flooding along the Connecticut coast.

Records do indicate that the coast of Connecticut has experienced hurricane tidal flooding on 66 occasions since 1769. On nine of these occasions severe tidal flooding did occur. The five greatest, as far as can be determined from existing records, were the hurricanes of 1938, 1893, 1954, 1815 and 1944 (in descending order of estimated magnitude) (Reference 3).

The Town of East Lyme has a total tidal shoreline of 8.6 miles; 5.0 miles on Long Island Sound and 3.6 miles on Niantic Bay and the Niantic River. The low-lying tidal shoreline areas of the town are subjected to periodic flooding by severe storms. The shoreline along the sound, with its high concentration of residential structures, is highly susceptible to heavy damage. Shoreline damages resulted in losses of $1,070,000 and $990,000 during the 1938 and 1954 hurricanes, respectively (Reference 4).

At the CCO meetings, comments were made regarding repeated coastal and riverine floodings. Tidal flooding occurs along Shore Drive, Shore Road and Atlantic Street just off Niantic Bay. Also, tidal flooding occurrences were reported on both the east and west shores of Black Point. Flooding at Giants Neck Road as a result of Bride Brook overflowing its banks was reported.

Tidal surges during severe storms cause flooding along streams flowing into either the Niantic River or Long Island Sound. Where structures are located in the flood plains of these streams, damage is inflicted.

Riverine flooding, not directly related to tidal surges, has occurred. Where structures are located in the flood plain, damage is inflicted. Such damage has been sustained by structures located along the Four-mile River and Latimer Brook.

2.4 Flood Protection Measures

According to the U. S. Army Corps of Engineers (COE), damages from the 1938 and 1954 hurricanes were scattered along almost all of the waterfront, with the greatest concentration being located along the west shore of Niantic Bay from the Black Point Beach Club to Crescent Beach. Consideration was given to protection on the flooded area in the vicinity of Oak Beach. The considered plan consisted of sand fill and diking along the shore with necessary tieback dikes to high ground. However, no work to construct such protection has ever been started (Reference 4).

A new dam has been constructed at the outlet from Gorton Pond. Design and construction was under the direction of the State of Connecticut Department of Environmental Protection (DEP). An emergency control gate regulates the storage behind the dam and the discharge over the dam.

The State of Connecticut and the U. S. Department of Agriculture are providing for protection of tidal marshes by prohibiting future development. Coastal flooding of marshes, as opposed to developed areas, will not result in large monetary losses.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example,

the risk of having a flood which equals or exceeds the 100-year flood (one-percent chance of annual occurrence) in any 50-year period is about 40 percent (four in ten) and, for any 90-year period, the risk increases to about 60 percent (six in ten). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail affecting the community.

To define discharge-frequency data for the Fourmile and Pattagansett Rivers and Latimer Brook, the U. S. Geological Survey (USGS) flood flow formulas for ungaged streams were used (Reference 5). These formulas were empirically derived from stream-gaging and precipitation-gaging stations in Connecticut with 10 to 45 years of record. The formulas utilized drainage basin characteristics and precipitation data and yielded the 100-year peak discharge. Values of the 10-, 50-, and 500-year peak discharges were determined from a log-Pearson Type III distribution which is obtained from the calculated 100-year peak discharges and a standard deviation and skew coefficient of annual maximum flows. A summary of drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
FOURMILE RIVER					
At Long Island Sound	6.57	450	740	910	1,400
At State Route 156	6.25	430	700	860	,300
At Interstate Route 95	5.80	410	680	830	1,250
At State Route 51	5.26	400	660	800	1,200
PATTAGANSETT RIVER					
At Long Island Sound	8.91	610	1,000	1,200	1,800
At State Route 156	7.53	560	930	1,100	1,700
At confluence with Dodge Pond Branch	6.70	500	840	1,000	1,500
At Interstate Route 95	4.98	450	740	900	1,400
At Pattagansett Lake outfall	3.83	390	640	780	1,200

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
LATIMER BROOK					
At confluence with the Niantic River	17.18	1,100	1,800	2,100	3,200
At confluence with Cranberry Meadow Brook	11.48	1,000	1,600	2,000	3,000

East Lyme has one stream-gaging station located at the Fourmile River crossing of Stone Ranch Road. Records have been obtained there for 17 years. However, the data gives only the mean annual flood levels. No continuous recording data are available. The available information was used and calculations were made using the log-Pearson Type III distribution. The resulting discharge-frequency data compared reasonably well with that obtained with the flood flow formulas for ungaged streams.

Tidal flood elevations for Long Island Sound and the Niantic River are based upon a storm-surge frequency curve from the COE report Long Island Sound, Interim Memo No. COE-2, Tidal Hydrology (Reference 3). This curve was developed by statistically combining elevations of the hurricanes of 1938 and 1954 and records of great historic storms with records of the U. S. Coastal and Geodetic Survey, and with municipal and public utility company tidal gages for a 26- to 42-year period starting in 1930. A summary of tidal frequency-elevation relationships is shown in Table 2, "Summary of Elevations."

TABLE 2 - SUMMARY OF ELEVATIONS

FLOODING SOURCE AND LOCATION	ELEVATIONS (Feet) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
LONG ISLAND SOUND				
At mouth of the Fourmile River	6.8	9.4	10.7	14.7
At mouth of the Niantic River	6.7	9.4	10.7	14.4

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in detail were carried out to provide estimates of the

elevations of floods of the selected recurrence intervals along each of these flooding sources.

Cross-section data for the Fourmile River, the Pattagansett River and Latimer Brook were obtained from photogrammetric maps (Reference 6). Data for the below-water sections were obtained by field measurement. All bridges and culverts on these streams were field-surveyed to obtain elevation data and structural geometry.

Roughness coefficients (Manning's "n" values) for the streams studied by detailed methods were estimated by field inspection at each cross section. For the Fourmile River, the roughness coefficients range from 0.02 to 0.08 for the channel and from 0.03 to 0.07 for the overbank areas. For the Pattagansett River, the coefficients range from 0.01 to 0.10 for the channel and from 0.02 to 0.10 for the overbank areas. For Latimer Brook, the coefficients range from 0.03 to 0.10 for the channel and from 0.01 to 0.10 for the overbank areas.

Water-surface profiles were developed using the COE HEC-2 computer program (Reference 7). Starting water-surface elevations were estimated between the mean spring tide levels and the coastal storm surge levels for the various return frequency floods. Comparisons of the profiles of the floods of the selected recurrence intervals were made with the estimated profiles and elevations of historic floods. Reasonable correlation was evident. The estimated profiles and elevations were obtained as the result of observations made in the field and interviews with town officials and local citizens.

Areas of coastline subjected to wave attack are referred to as coastal high hazard zones. Coastal high hazard zones were identified by use of the abbreviated analytical method described in Section 2 of Guidelines for Identifying Coastal High Hazard Zones by the COE (Reference 8). In determining coastal high hazard zones, consideration was given to reaches of open water which were sufficiently long to permit generation of damaging waves. Some shelter of the study area from the open sea is afforded by Long Island.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals. Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross-section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 3).

The 100-year flood for the streams studied by approximate methods was determined using field surveys, community and historic data,

engineering judgment and the Flood Hazard Boundary Map for East Lyme (Reference 9).

All elevations used in this study are referenced to the National Geodetic Vertical Datum of 1929 (NGVD), formerly referred to as Sea Level Datum of 1929. Locations of the elevation reference marks used in the study are shown on the maps.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are valid only if hydraulic structures remain unobstructed, and dams and other flood control structures operate properly and do not fail.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using photogrammetric maps at a scale of 1:2,400 and topographic maps at a scale of 1:24,000 with a contour interval of 10 feet (References 6 and 10, respectively). In cases where the 100- and 500-year flood boundaries are close together, only the 100-year boundary has been shown.

Approximate study streams were delineated using field surveys, community and historic data, engineering judgment and the Flood Hazard Boundary Map for East Lyme (Reference 9).

The boundaries of the 100- and 500-year floods of the streams studied in detail are shown on the Flood Boundary and Floodway Map (Exhibit 3). For the tidal areas, flood boundaries are indicated on the Flood Insurance Rate Map. On this map, special flood hazards inundated by the 100-year flood which have additional hazards due to wave action have been designated as Zone V8. The 100-year flood boundary corresponds to the boundary of the areas of special flood hazard

(Zones A1, A2, A3, A4, A5, A7 and A8), and the 500-year flood boundary corresponds to the boundary of the areas of moderate flood hazards (Zone B).

Small areas within the flood boundaries may lie above the flood elevations and, therefore, may not be subject to flooding. Owing to limitations of the map scale and lack of detailed topographic data, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood can be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plains. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway is computed (Table 3).

Near the mouths of streams studied in detail, floodway computations are made without regard to flood elevations on the receiving water body. Therefore, "With Floodway" elevations presented in Table 3 for certain downstream cross sections of the Fourmile and Pattagansett Rivers and Latimer Brook are lower than the regulatory flood elevations in that area, which must take into account the 100-year flooding due to backwater from other sources.

As shown on the Flood Boundary and Floodway Map (Exhibit 3), the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Fourmile River (continued)								
S	17,155	50	167	5.0	65.7	65.7	66.5	0.8
T	18,925	50	159	5.2	73.3	73.3	74.3	1.0
Pattagansett River								
A	1,250	360	1,897	0.6	10.7	4.3[2]	4.3	0.0
B	3,070	130	573	2.1	10.7	4.5[2]	4.5	0.0
C	5,070	70	503	2.4	10.7	4.7[2]	5.0	0.3
D	7,320	70	375	3.2	10.7	4.7[2]	5.3	0.6
E	9,620	130	577	1.7	11.1	11.1	11.7	0.6
F	10,270	100	364	2.7	12.9	12.9	13.1	0.2
G	11,670	150	487	2.1	14.4	14.4	15.3	0.9
H	12,430	200	1,365	0.7	19.7	19.7	19.7	0.0
I	13,740	60	185	5.4	20.3	20.3	21.0	0.7
J	14,220	120	531	1.9	25.4	25.4	25.5	0.1
K	14,735	180	322	3.1	28.5	28.5	28.5	0.0
L	15,655	460	935	1.1	28.5	28.5	28.6	0.1
M	17,165	510	951	1.1	28.5	28.5	28.6	0.1

[1]Feet above confluence with Long Island Sound
[2]Elevations computed without consideration of tidal flooding from Long Island Sound

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT

(NEW LONDON CO.)

FLOODWAY DATA

FOURMILE RIVER AND PATTAGANSETT RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Pattagansett River (continued)								
N	18,345[1]	370	762	1.3	28.5	28.5	28.6	0.1
O	20,178[1]	140	320	3.1	31.6	31.6	32.1	0.5
P	21,788[1]	80	168	5.9	34.4	34.4	34.5	0.1
Q	22,588[1]	60	323	3.1	38.3	38.3	38.5	0.2
R	24,088[1]	60	341	2.6	41.9	41.9	41.9	0.0
S	25,653[1]	140	675	1.3	42.8	42.8	43.7	0.9
T	26,653[1]	110	248	3.6	43.5	43.5	44.5	1.0
U	27,628[1]	190	490	1.8	48.7	48.7	49.0	0.3
V	29,078[1]	140	318	2.8	51.4	51.4	52.0	0.6
W	30,048[1]	98	149	5.2	58.2	58.2	58.5	0.3
Latimer Brook								
A	240[2]	107	631	3.3	10.7	4.8[3]	5.8	1.0
B	1,380[2]	45	229	9.2	10.7	9.8[3]	10.6	0.8
C	2,880[2]	60	212	9.9	32.6	32.6	32.6	0.0
D	3,295[2]	115	281	7.5	43.0	43.0	43.0	0.0
E	4,000[2]	55	562	3.7	47.2	47.2	47.3	0.1

[1] Feet above confluence with Long Island Sound
[2] Feet above confluence with Niantic River
[3] Elevations computed without consideration of backwater effects from Niantic River

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

FLOODWAY DATA

PATTAGANSETT RIVER AND LATIMER BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Latimer Brook (continued)								
F	4,980	150	745	2.8	47.3	47.3	47.5	0.2
G	6,030	200	677	3.1	47.8	47.8	48.4	0.6
H	7,580	200	651	3.2	50.1	50.1	50.8	0.7
I	9,080	120	508	4.1	56.3	56.3	57.3	1.0
J	10,130	220	941	2.2	58.7	58.7	59.6	0.9
K	11,450	170	673	3.1	61.7	61.7	62.7	1.0
L	13,010	120	1,020	2.1	69.9	69.9	69.9	0.0
M	14,070	120	856	2.5	70.0	70.0	70.2	0.2
N	15,920	120	689	3.0	70.1	70.1	71.0	0.9
O	17,520	650	3,576	0.6	71.1	71.1	71.9	0.8
P	18,580	170	567	3.7	71.5	71.5	72.3	0.8
Q	20,010	125	641	3.3	74.8	74.8	75.8	1.0
R	20,950	125	795	2.6	78.2	78.2	78.6	0.4
S	22,070	125	667	3.0	78.7	78.7	79.7	1.0

[1] Feet above confluence with Niantic River

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

FLOODWAY DATA

LATIMER BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Fourmile River								
A	1,030	50/25[2]	378	2.4	10.7	4.2[3]	4.3	0.1
B	2,570	50/25[2]	416	2.2	10.7	4.2[3]	4.6	0.4
C	3,970	40/20[2]	236	3.9	10.7	5.1[3]	5.6	0.5
D	5,020	30/15[2]	235	3.7	10.7	9.1[3]	9.4	0.3
E	6,400	40/20[2]	96	9.0	11.9	11.9	12.1	0.2
F	6,645	70/35[2]	492	1.7	24.7	24.7	25.6	0.9
G	7,745	35/18[2]	184	4.7	26.1	26.1	27.0	0.9
H	8,545	35/18[2]	93	9.3	41.5	41.5	41.5	0.0
I	8,855	17/9[2]	150	5.7	49.6	49.6	49.6	0.0
J	9,295	20/10[2]	179	4.8	51.0	51.0	51.5	0.5
K	10,065	150/37[2]	865	1.0	52.2	52.2	53.1	0.9
L	10,825	80/25[2]	283	2.9	52.2	52.2	53.2	1.0
M	11,485	80	435	1.9	53.0	53.0	53.7	0.7
N	12,185	50	338	2.5	54.8	54.8	55.2	0.4
O	13,245	40	217	3.8	54.8	54.8	55.7	0.9
P	13,935	40	453	1.8	56.1	56.1	56.6	0.5
Q	14,655	50	175	4.7	58.9	58.9	59.6	0.7
R	16,105	50	201	4.1	62.5	62.5	63.3	0.8

[1] Feet above confluence with Long Island Sound
[2] Width/width within corporate limits
[3] Elevations computed without consideration of tidal flooding from Long Island Sound

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

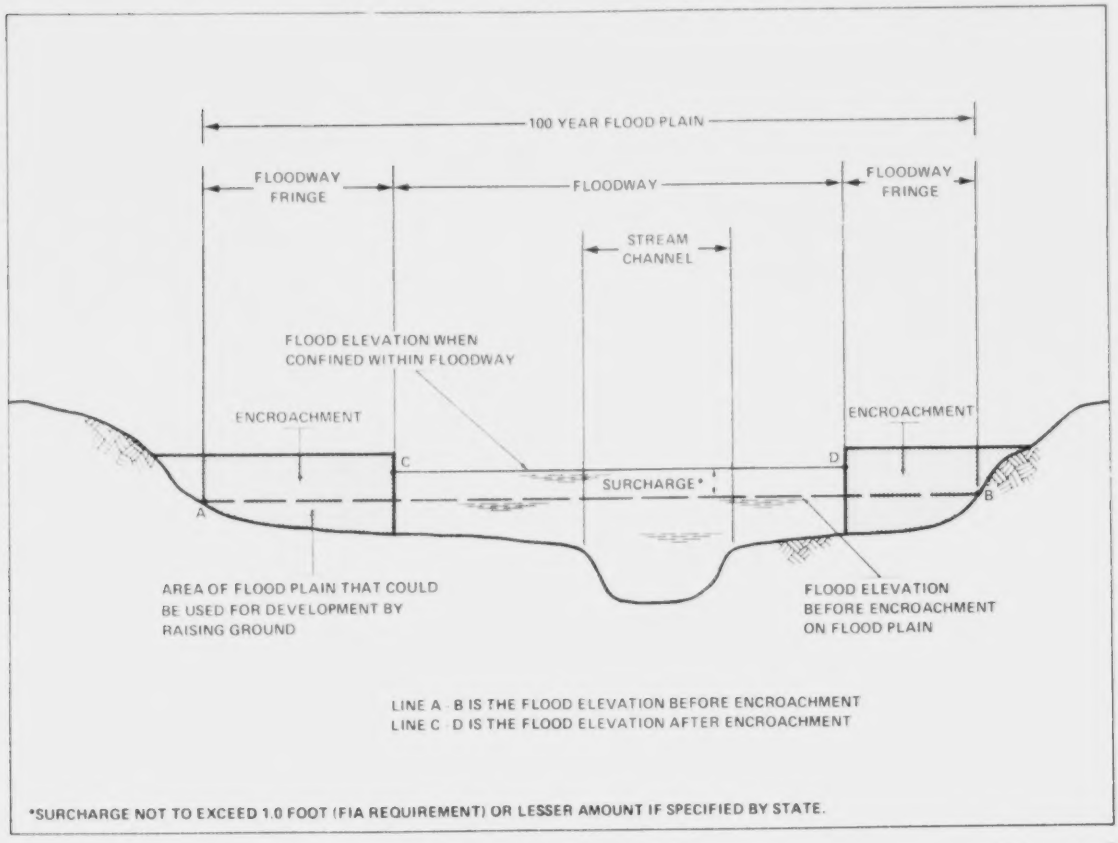
TOWN OF EAST LYME, CT

(NEW LONDON CO.)

FLOODWAY DATA

FOURMILE RIVER

without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC Figure 2

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each flooding source affecting the Town of East Lyme.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the flooding sources of the Town of East Lyme are shown on the Flood Profiles (Exhibit 1) and are summarized in the Flood Insurance Zone Data Table (Table 4).

5.2 Flood Hazard Factors

The FHF is the FIA device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the Town of East Lyme was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Latimer Brook							
Reach 1	10	-1.7	-0.6	+1.8	015	A3	Varies
Reach 2	10	-3.4	-0.5	+0.9	035	A7	Varies
Reach 3	10	-1.3	-0.3	+0.8	015	A3	Varies
Reach 4	10	-2.6	-1.2	+0.1	025	A5	Varies
Reach 5	05, 10	-1.6	-0.6	+0.9	015	A3	Varies
Reach 6	05	-2.2	-0.5	+1.6	020	A4	Varies
Long Island Sound							
Reach 1	10, 15	-4.0	-1.3	+3.9	040	A8,V8	11

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

FLOOD INSURANCE ZONE DATA

LATIMER BROOK AND LONG ISLAND SOUND

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.
Zones A1, A2, A3, A4, A5, A7, and A8:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHF.
Zone V8:	Special Flood Hazard Areas along coasts inundated by the 100-year flood as determined by detailed methods, and that have additional hazards due to velocity (wave action); base flood elevations shown, and zones subdivided according to FHFs.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also, areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 4, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for the flooding sources studied in detail in the Town of East Lyme.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Town of East Lyme is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

Flood Insurance Studies for the Towns of Old Lyme, Lyme, and Montville have been completed (References 11, 12, and 13). The tidal hydrologic data used in this study were drawn from a previous study conducted by the COE in 1973 of the coastline between Willets Point, New York, and Pawcatuck Point, Connecticut (Reference 3). The Town of East Lyme lies within this area. The COE study provides consistent results for communities that base their tidal flooding elevation on that source. Flood Insurance Studies for the Towns of Salem and Waterford are currently being prepared (References 14 and 15). The results of those studies will be in exact agreement with the results of this study.

This study is authoritative for purposes of the Flood Insurance Program, and the data presented here either supersede or are compatible with previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the office of the Insurance and Mitigation Division of the Federal Emergency Management Agency, Regional Director, Region I Office, J. W. McCormack Post Office and Courthouse Building, Room 462, Boston, Massachusetts 02109.

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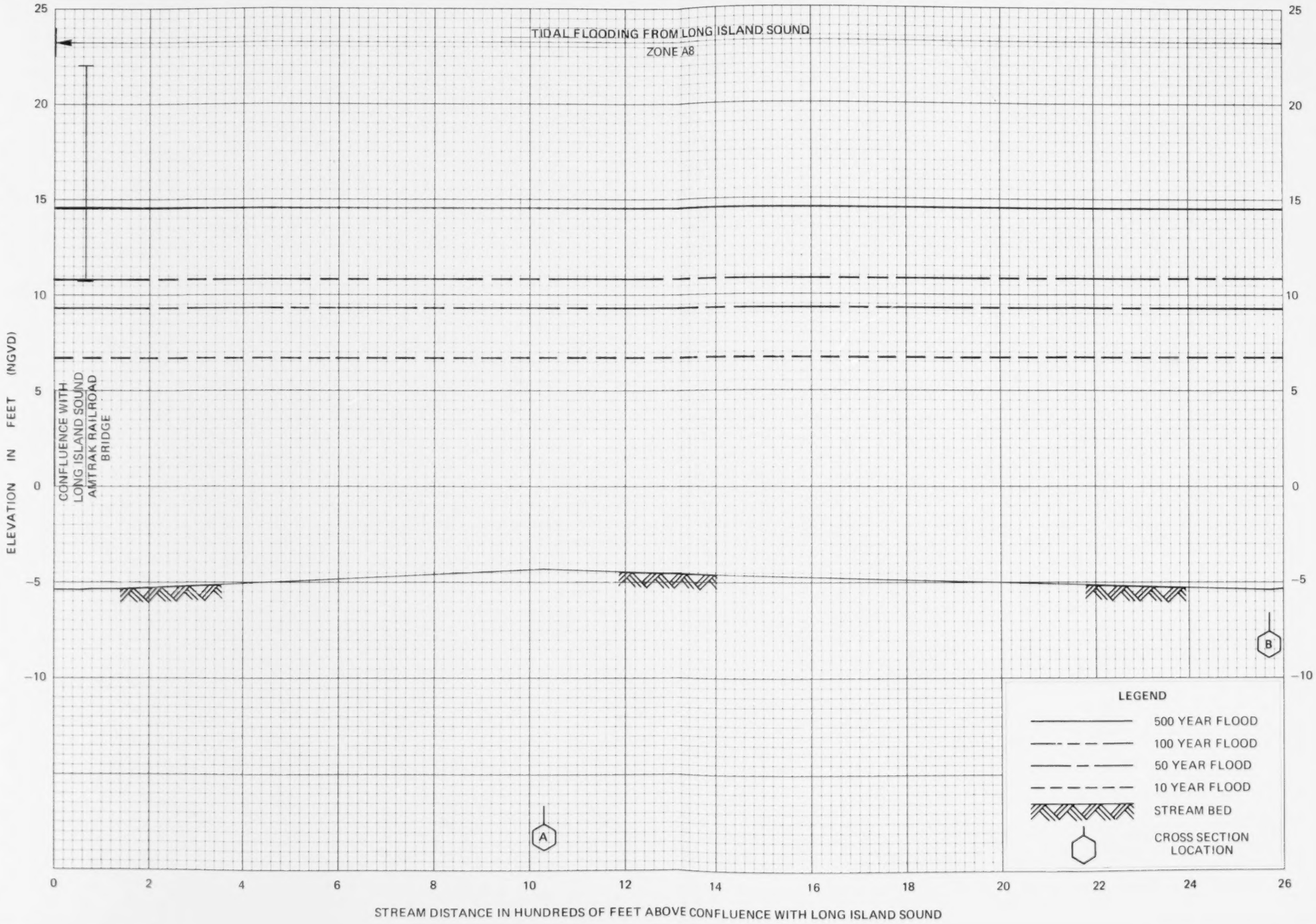


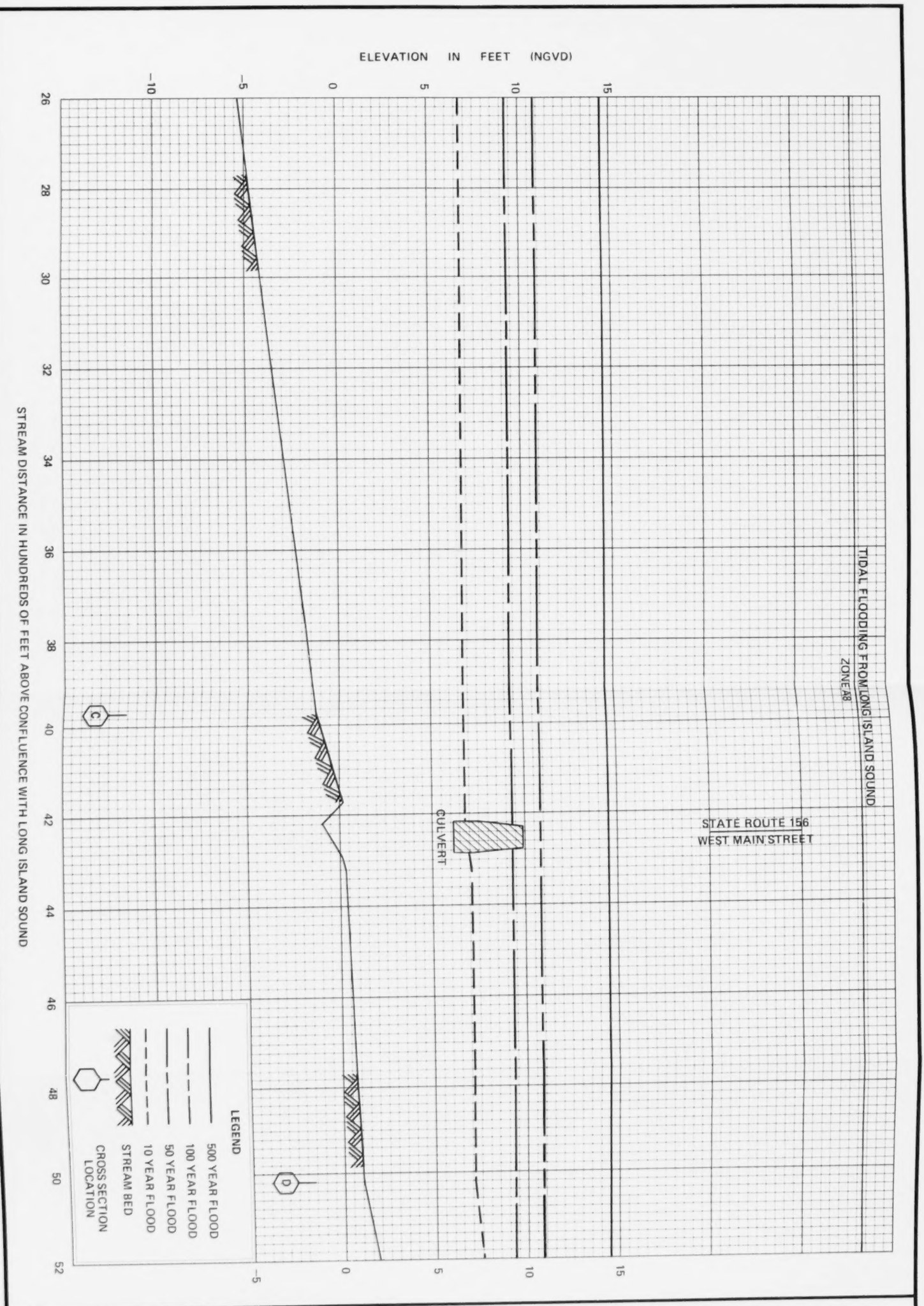
FLOOD PROFILES

FOURMILE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

01P



FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

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FLOOD PROFILES

FOURMILE RIVER

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Fourmile River							
Reach 1	15	-1.1	-0.5	+1.6	010	A2	Varies
Reach 2	15	-3.4	-1.7	+4.7	035	A7	Varies
Reach 3	10, 15	-1.8	-0.7	+3.9	020	A4	Varies
Reach 4	10	-0.9	-0.3	+1.5	010	A2	Varies
Pattagansett River							
Reach 1	15	-1.2	-0.5	+2.3	010	A2	Varies
Reach 2	15	-2.4	-1.2	+0.5	025	A5	Varies
Reach 3	10, 15	-0.6	-0.2	+0.4	005	A1	Varies
Reach 4	10	-0.8	-0.2	+0.5	010	A2	Varies
Reach 5	10	-1.8	-0.2	+0.5	020	A4	Varies
Reach 6	10	-2.6	-1.5	+2.6	025	A5	Varies
Reach 7	10	-1.0	-0.3	+0.6	010	A2	Varies
Reach 8	10	-0.6	-0.2	+0.5	005	A1	Varies

[1]Flood Insurance Rate Map Panel

[2]Weighted average

[3]Rounded to the nearest foot - see map

TABLE 4

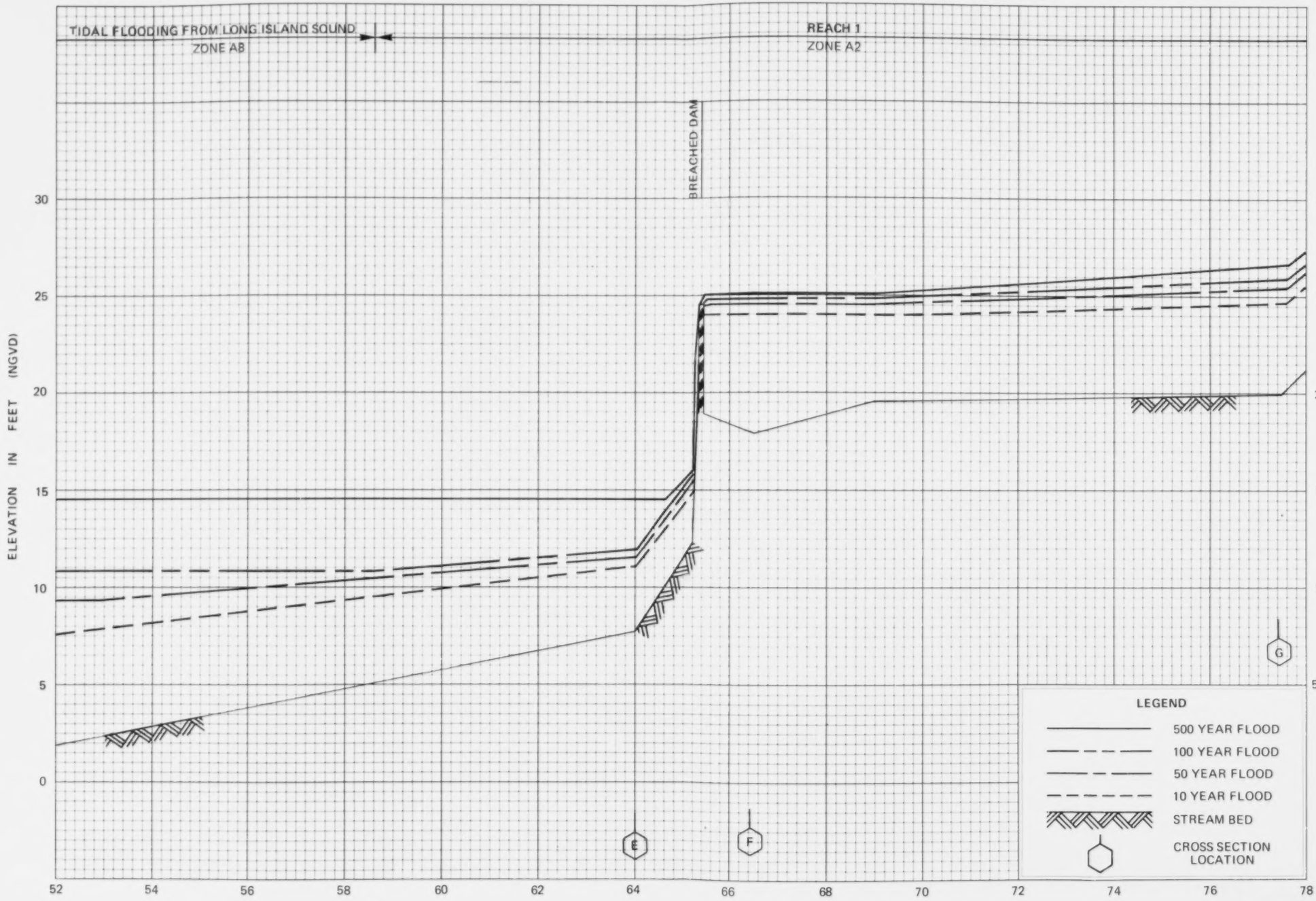
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT

(NEW LONDON CO.)

FLOOD INSURANCE ZONE DATA

FOURMILE RIVER AND PATTAGANSETT RIVER



FLOOD PROFILES

FOURMILE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

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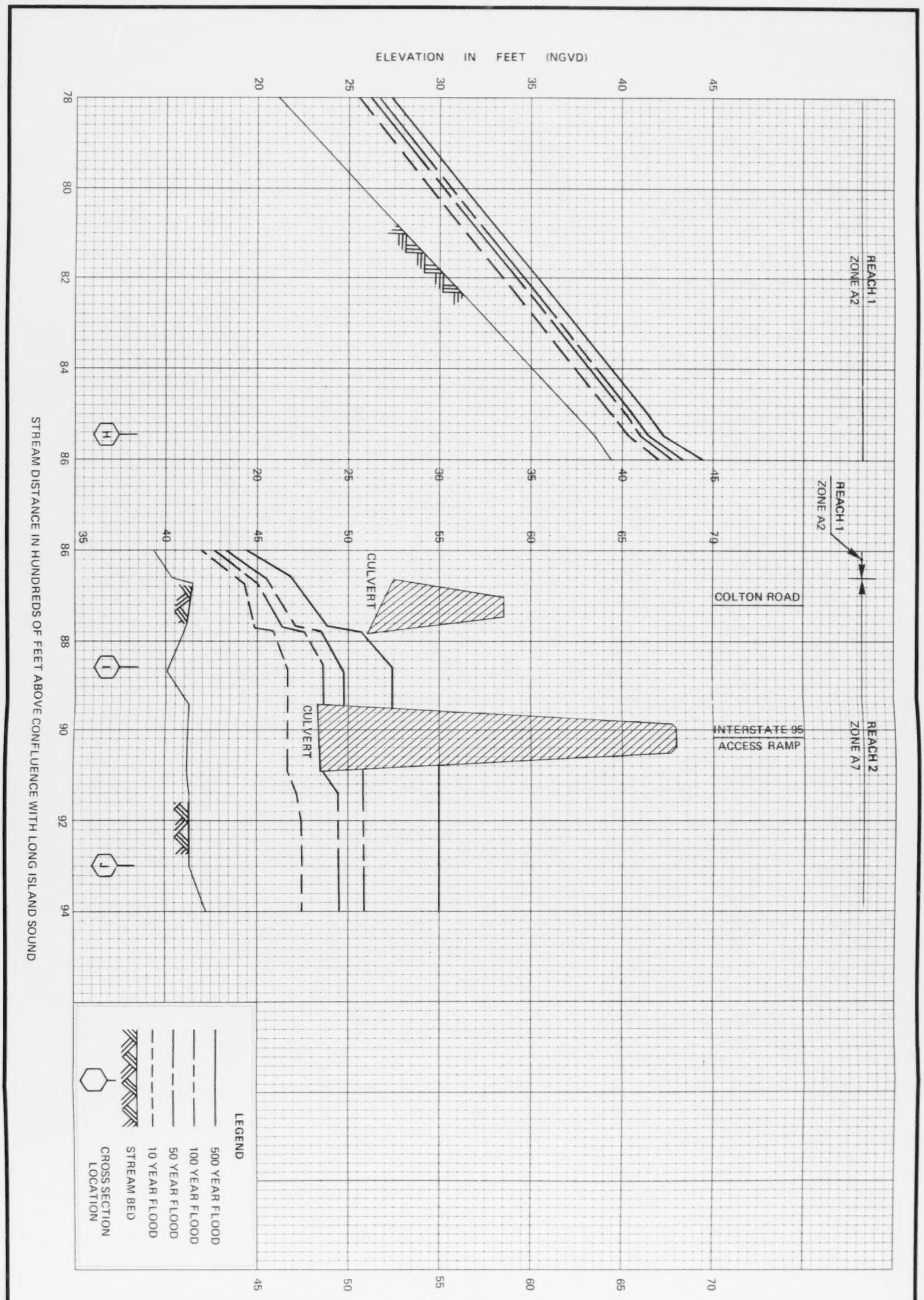

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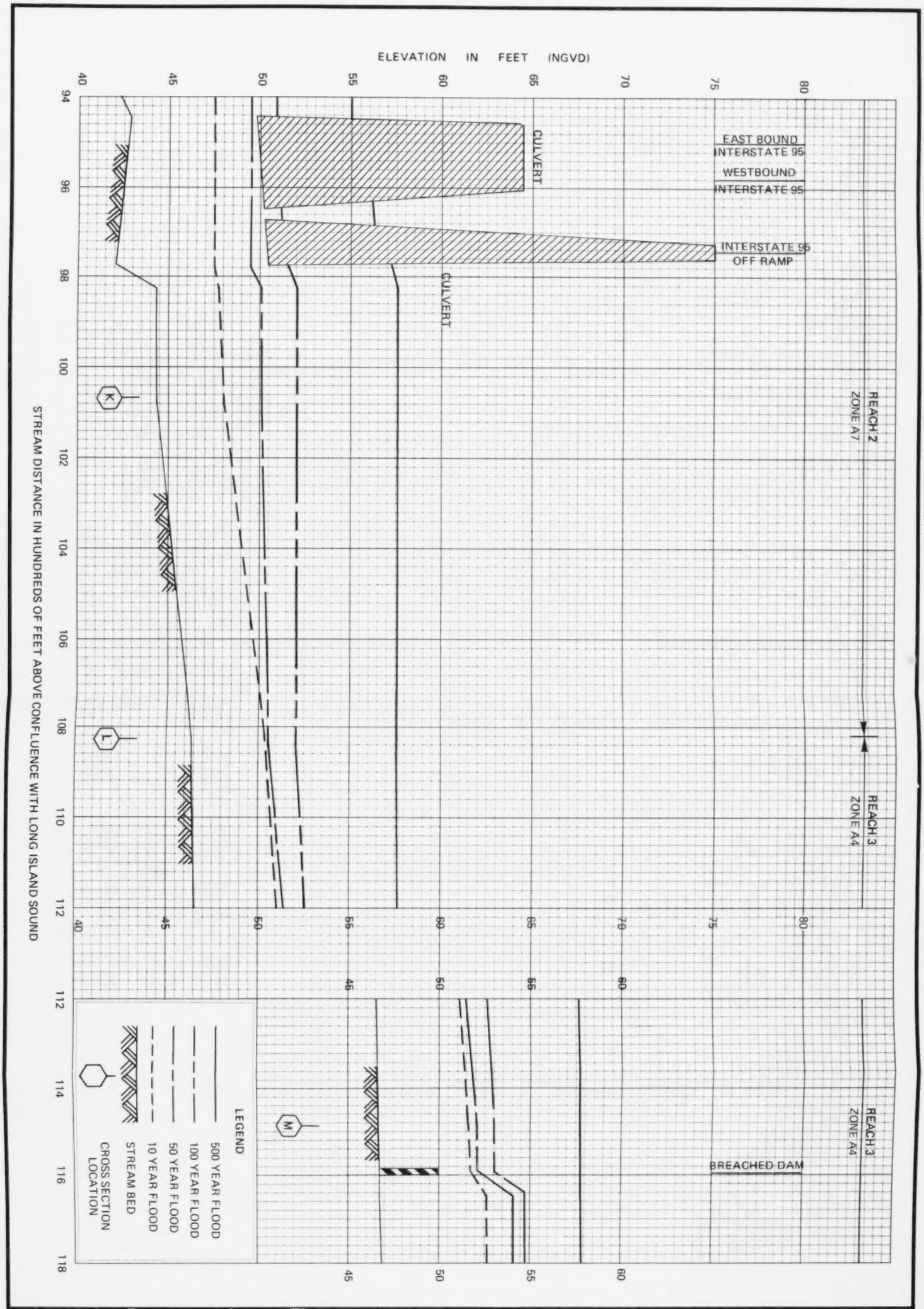
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

FLOOD PROFILES

FOURMILE RIVER



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FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

FLOOD PROFILES

FOURMILE RIVER

FLOOD PROFILES

FOURMILE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

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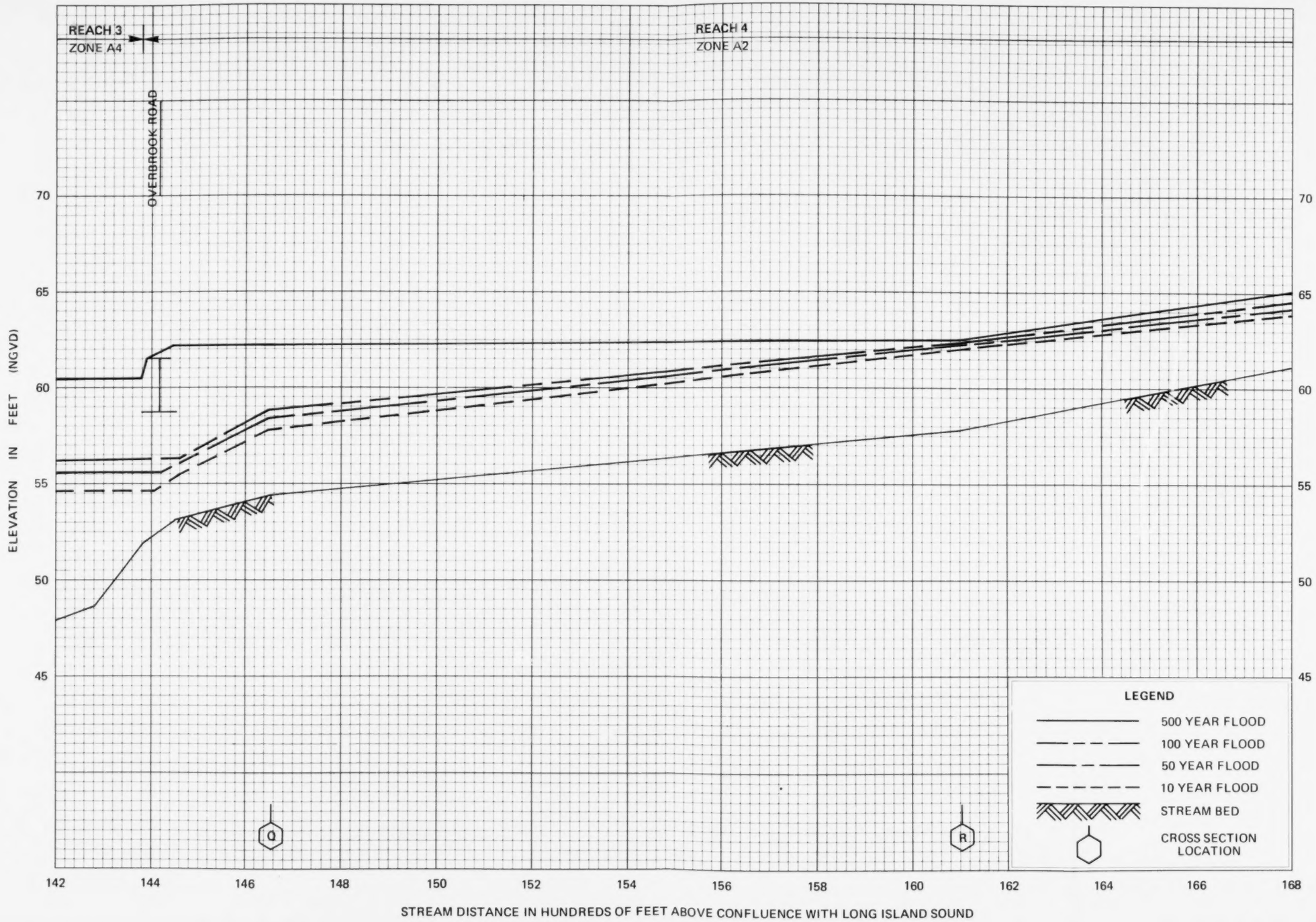

FLOOD PROFILES

FOURMILE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

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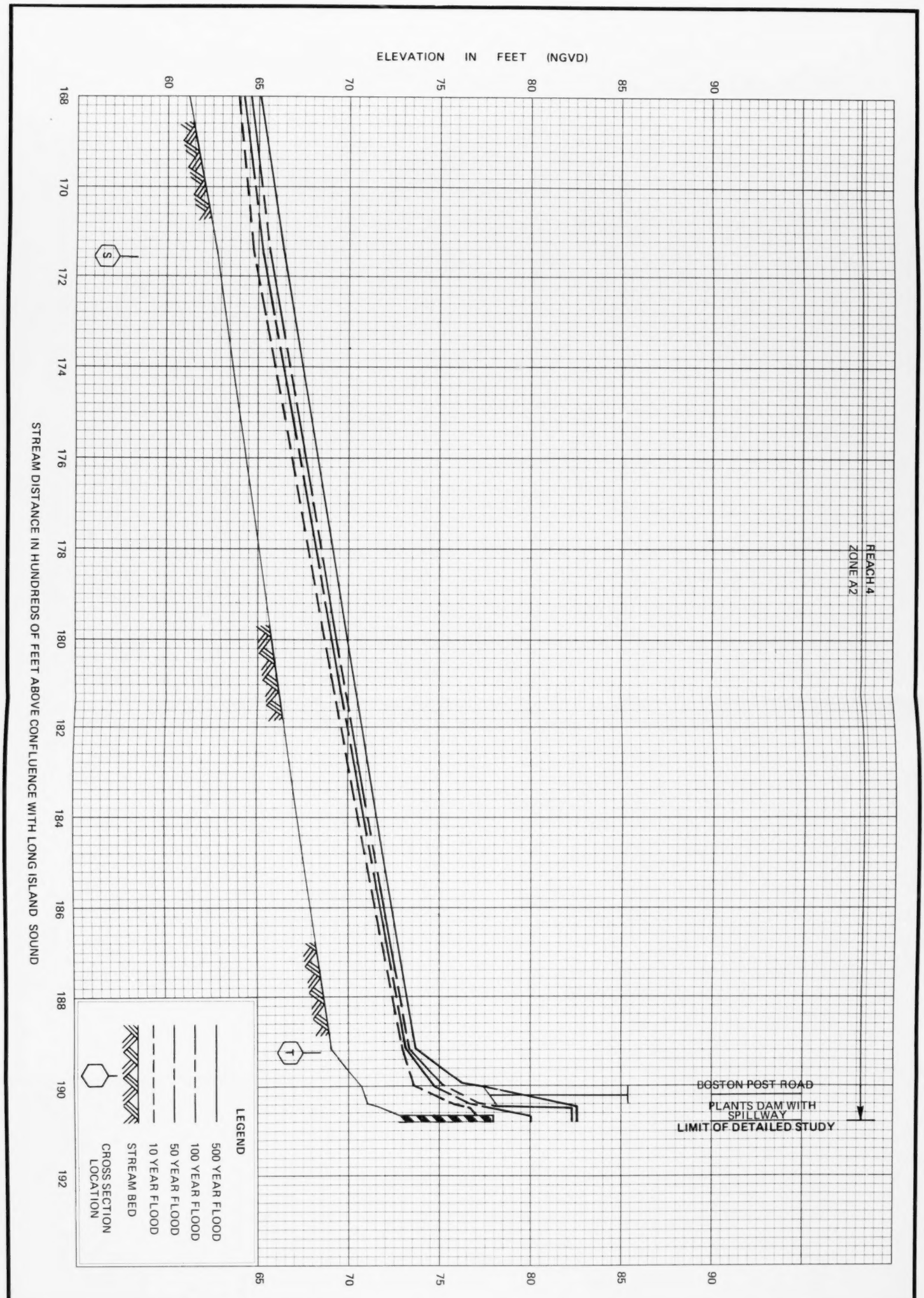

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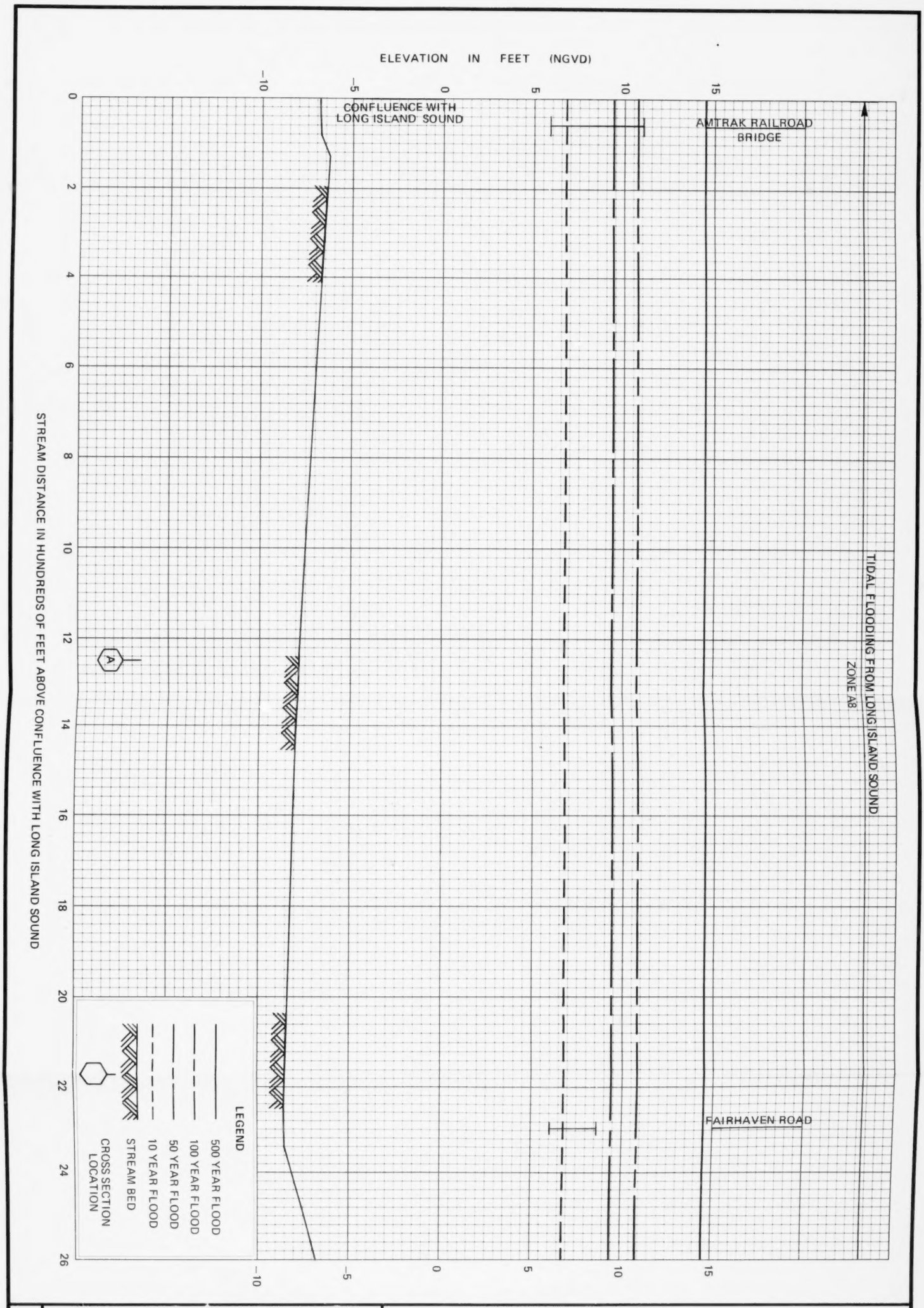
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

FLOOD PROFILES

FOURMILE RIVER



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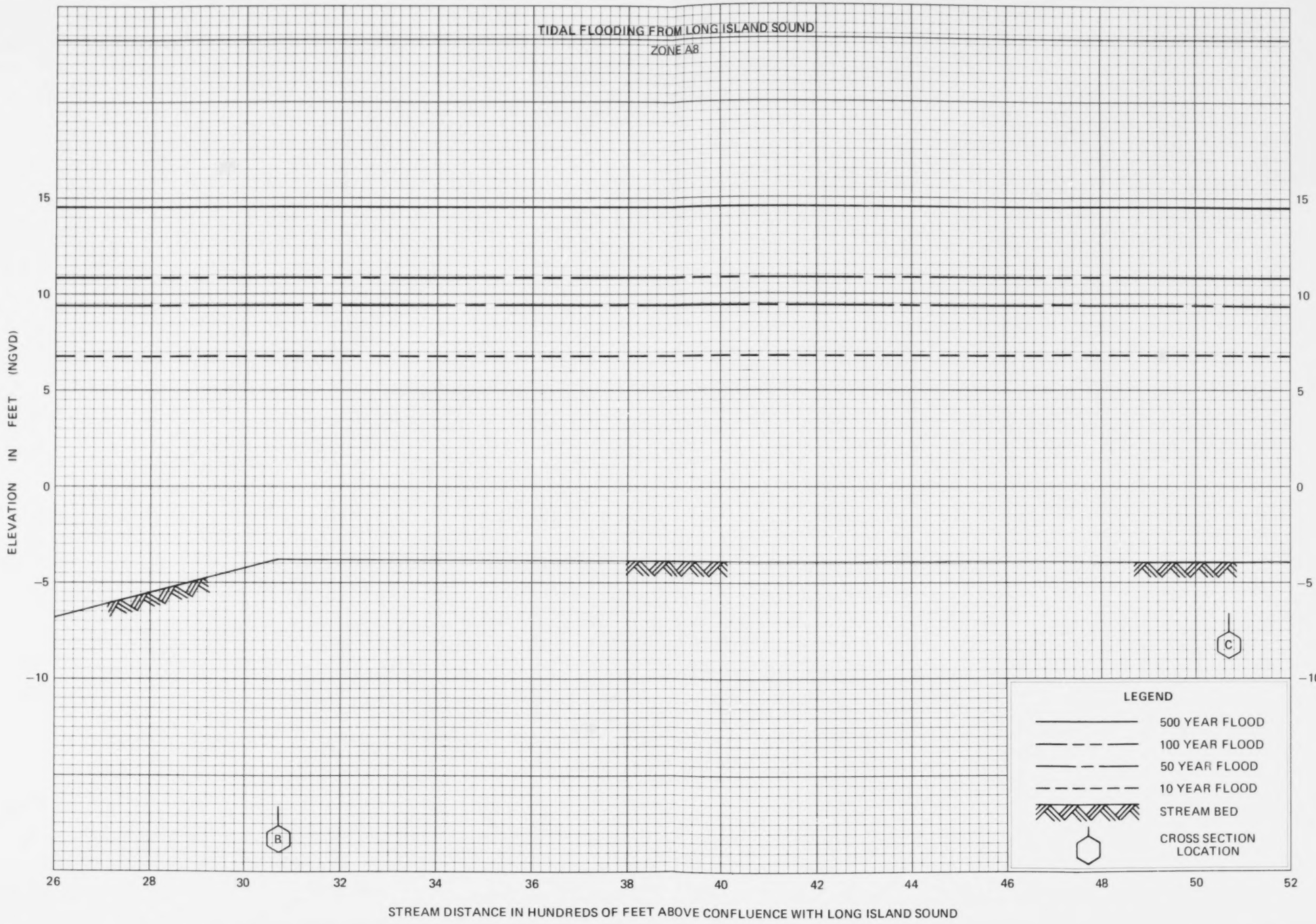
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

FLOOD PROFILES

PATTAGANSETT RIVER



FLOOD PROFILES

PATTAGANSETT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

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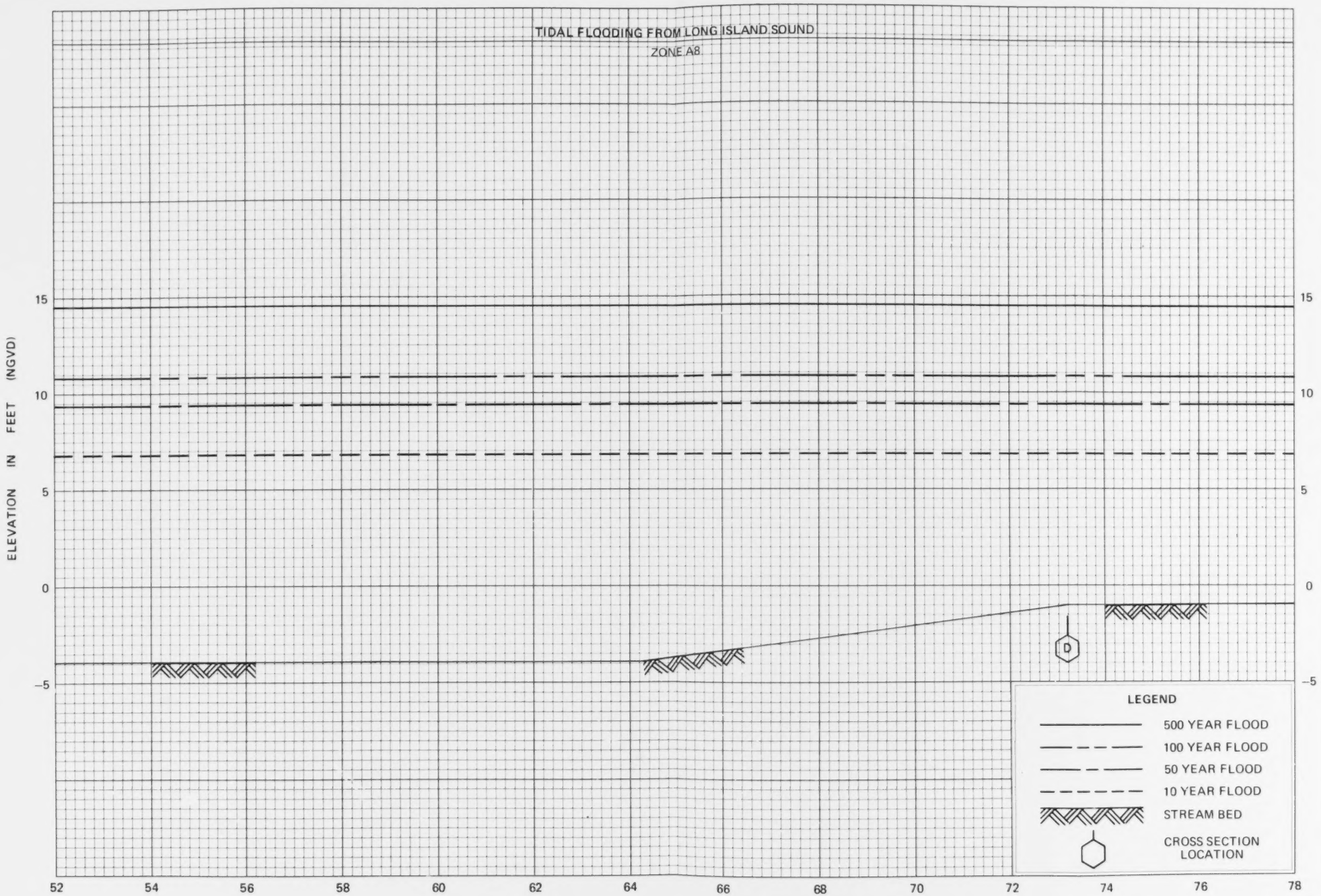
TIDAL FLOODING FROM LONG ISLAND SOUND

ZONE A8



STREAM DISTANCE IN HUNDREDS OF FEET ABOVE CONFLUENCE WITH LONG ISLAND SOUND

FLOOD PROFILES

PATTAGANSETT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

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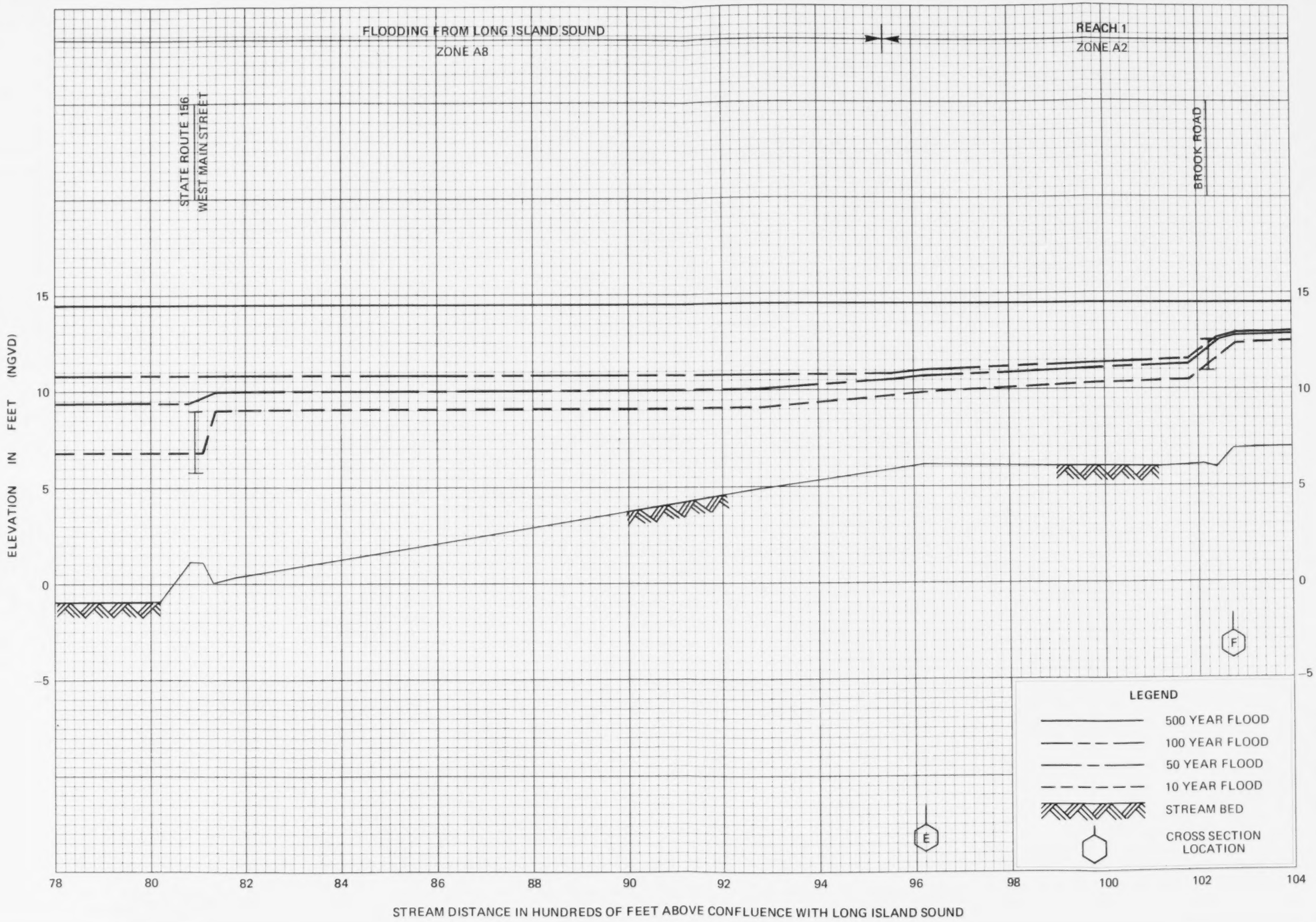

FLOOD PROFILES

PATTAGANSETT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

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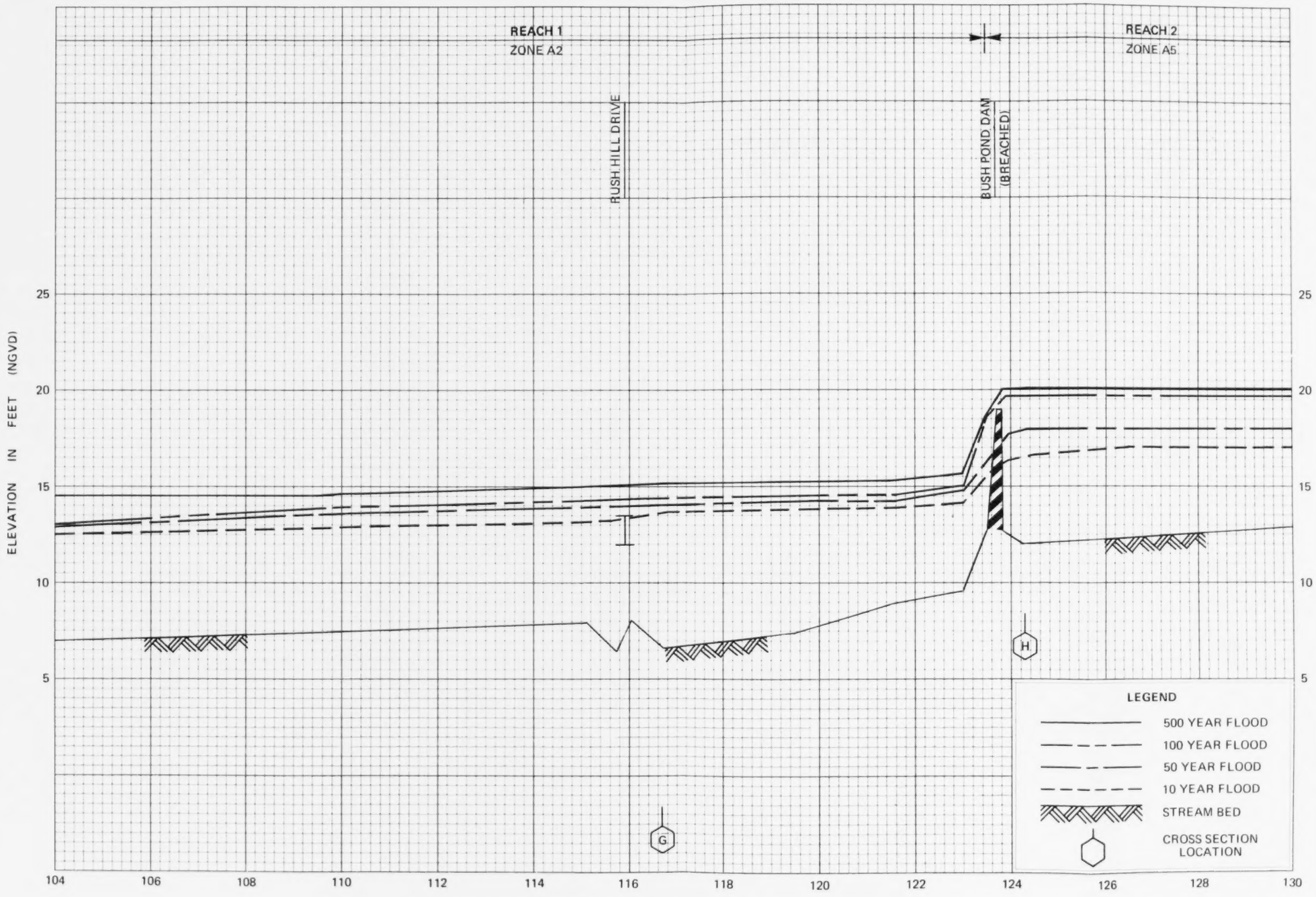

FLOOD PROFILES

PATTAGANSETT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

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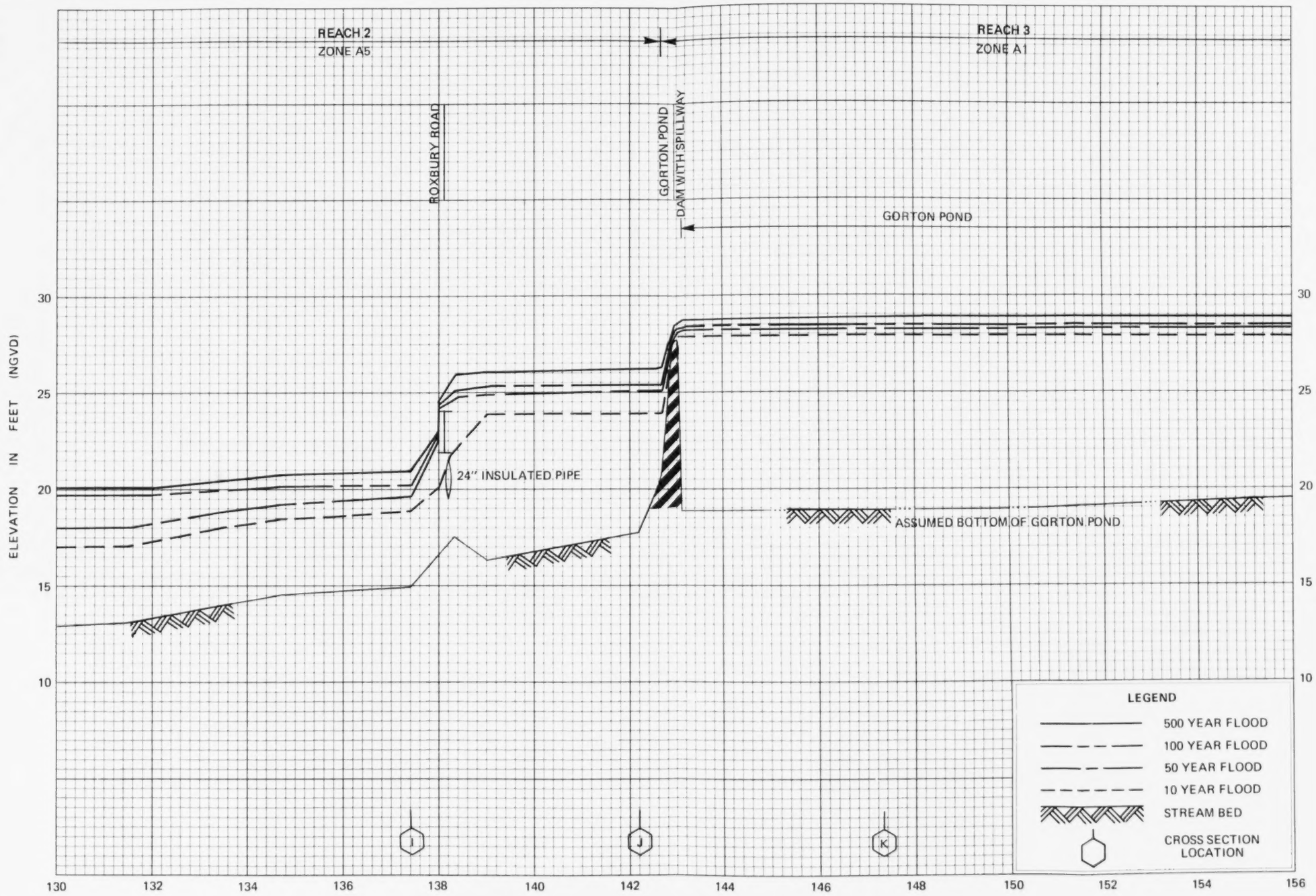


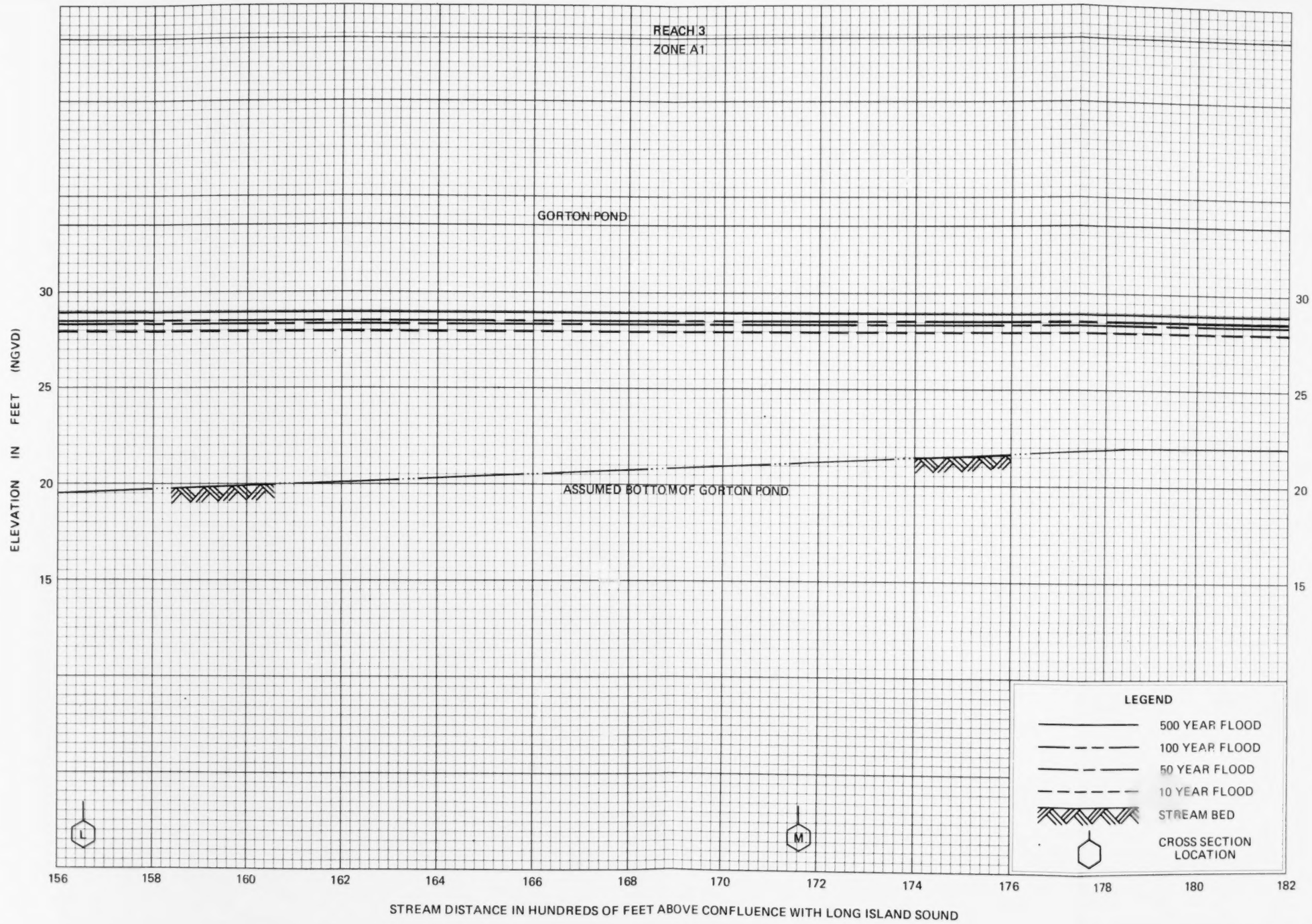
FLOOD PROFILES

PATTAGANSETT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

14P



FLOOD PROFILES

PATTAGANSETT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

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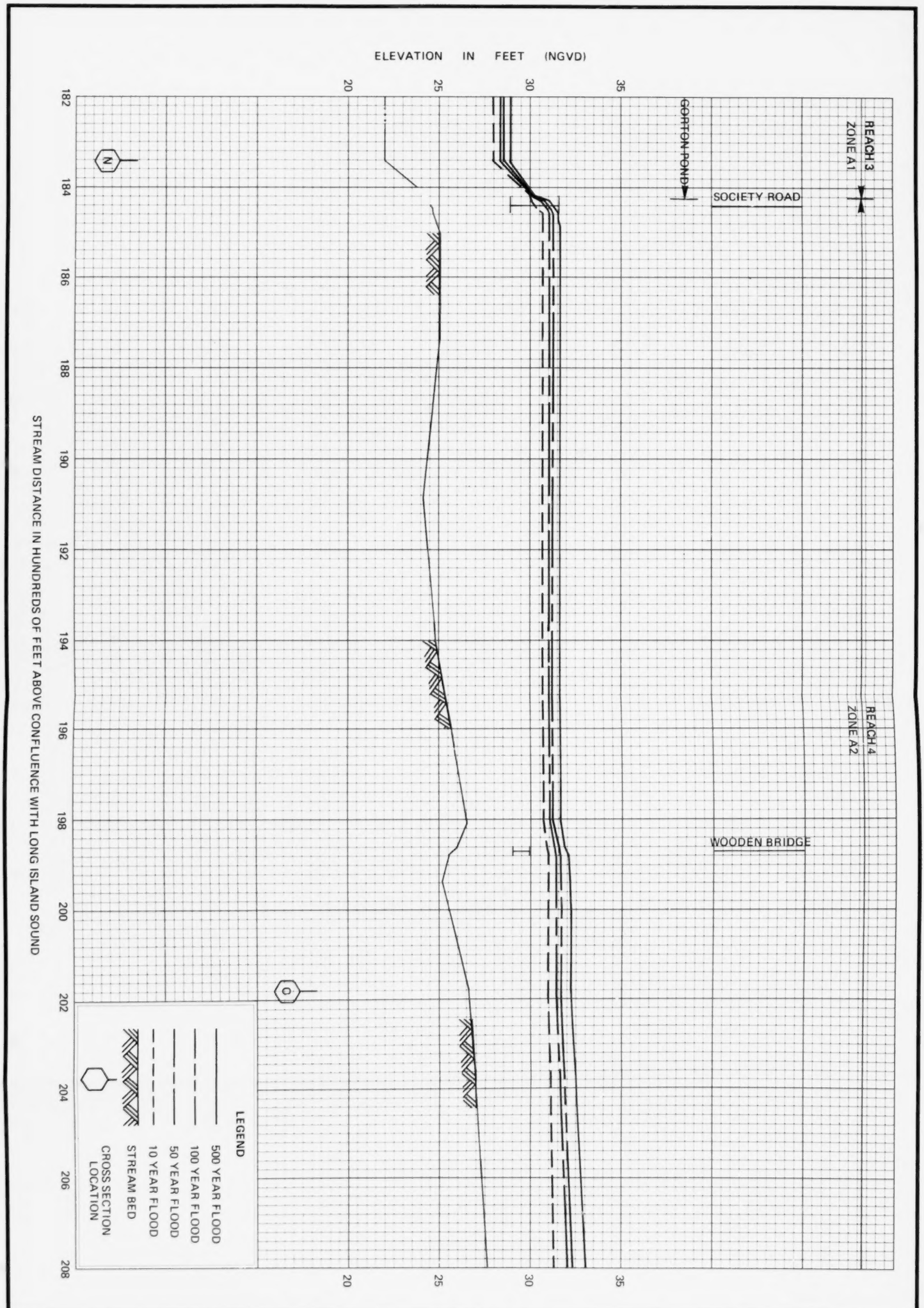

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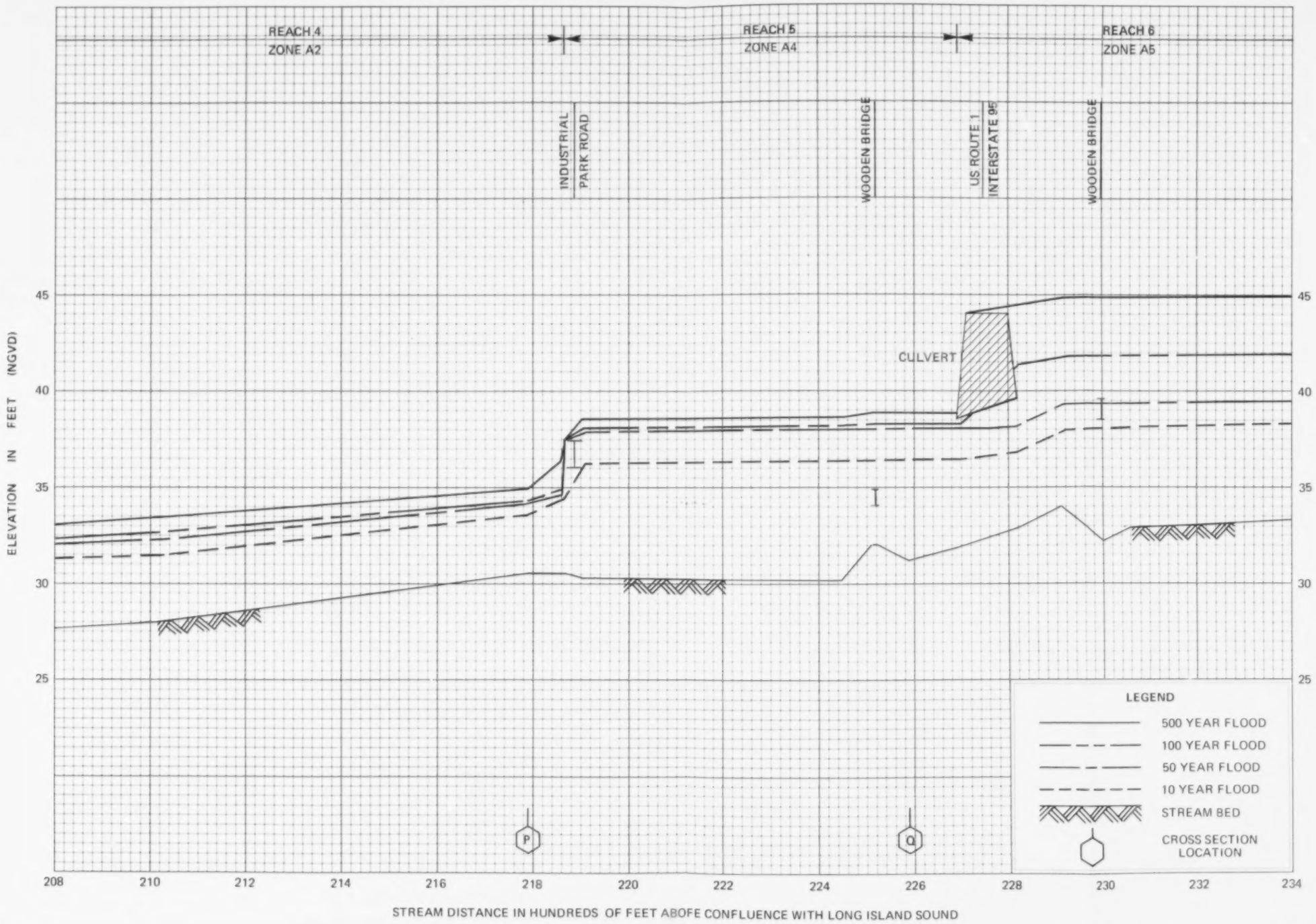
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

FLOOD PROFILES

PATTAGANSETT RIVER



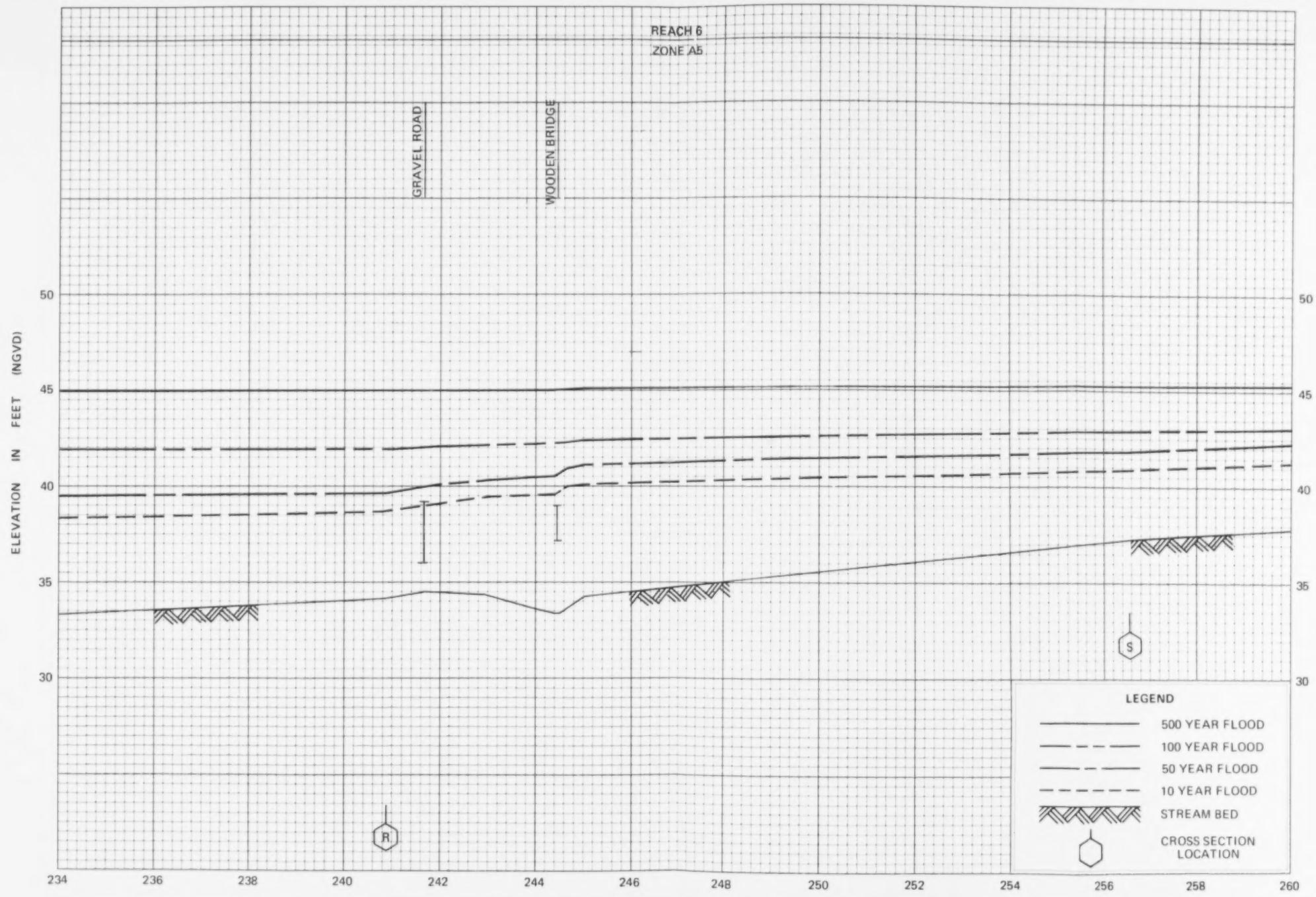
FLOOD PROFILES

PATTAGANSETT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

17P



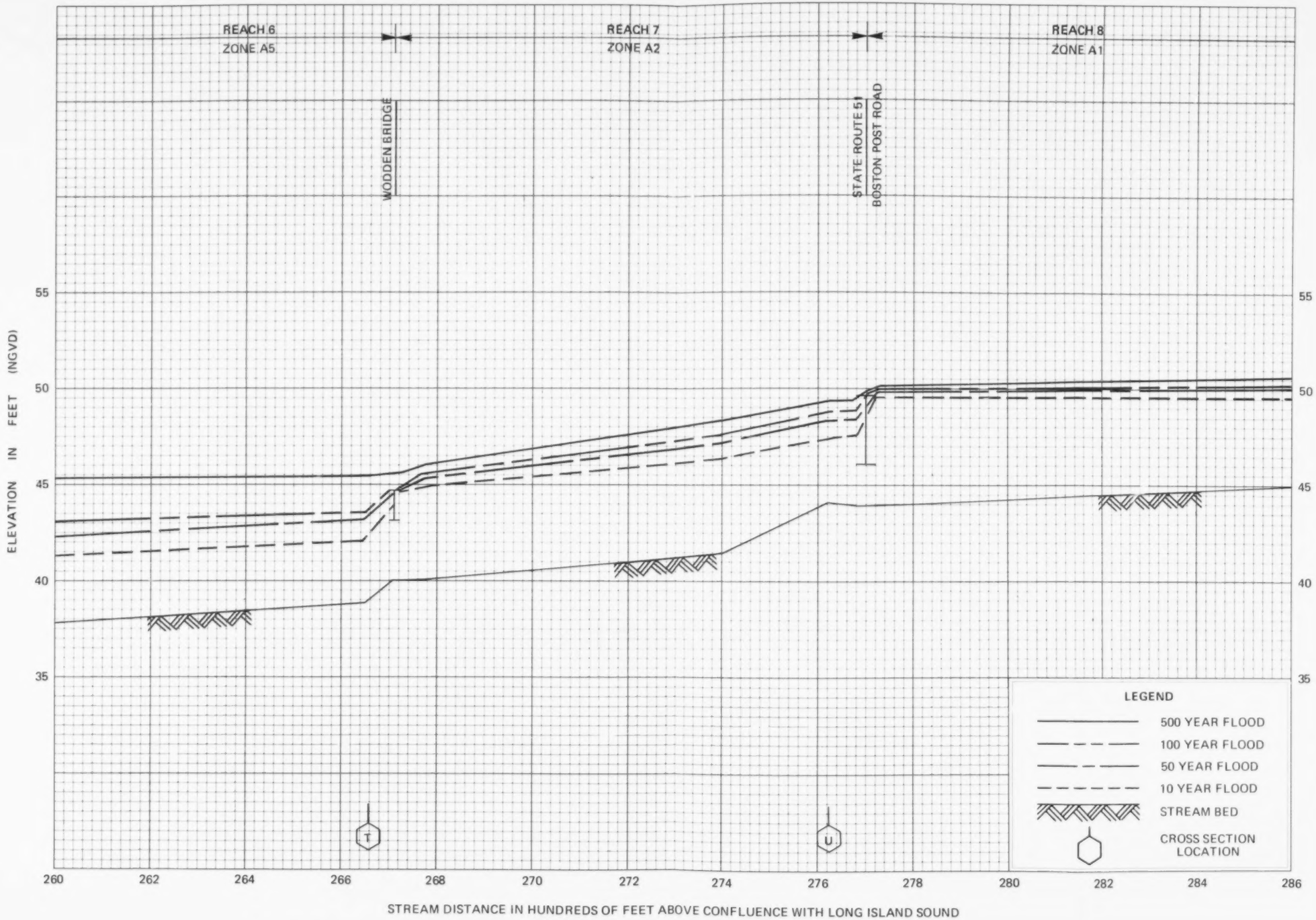
FLOOD PROFILES

PATTAGANSETT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

18P



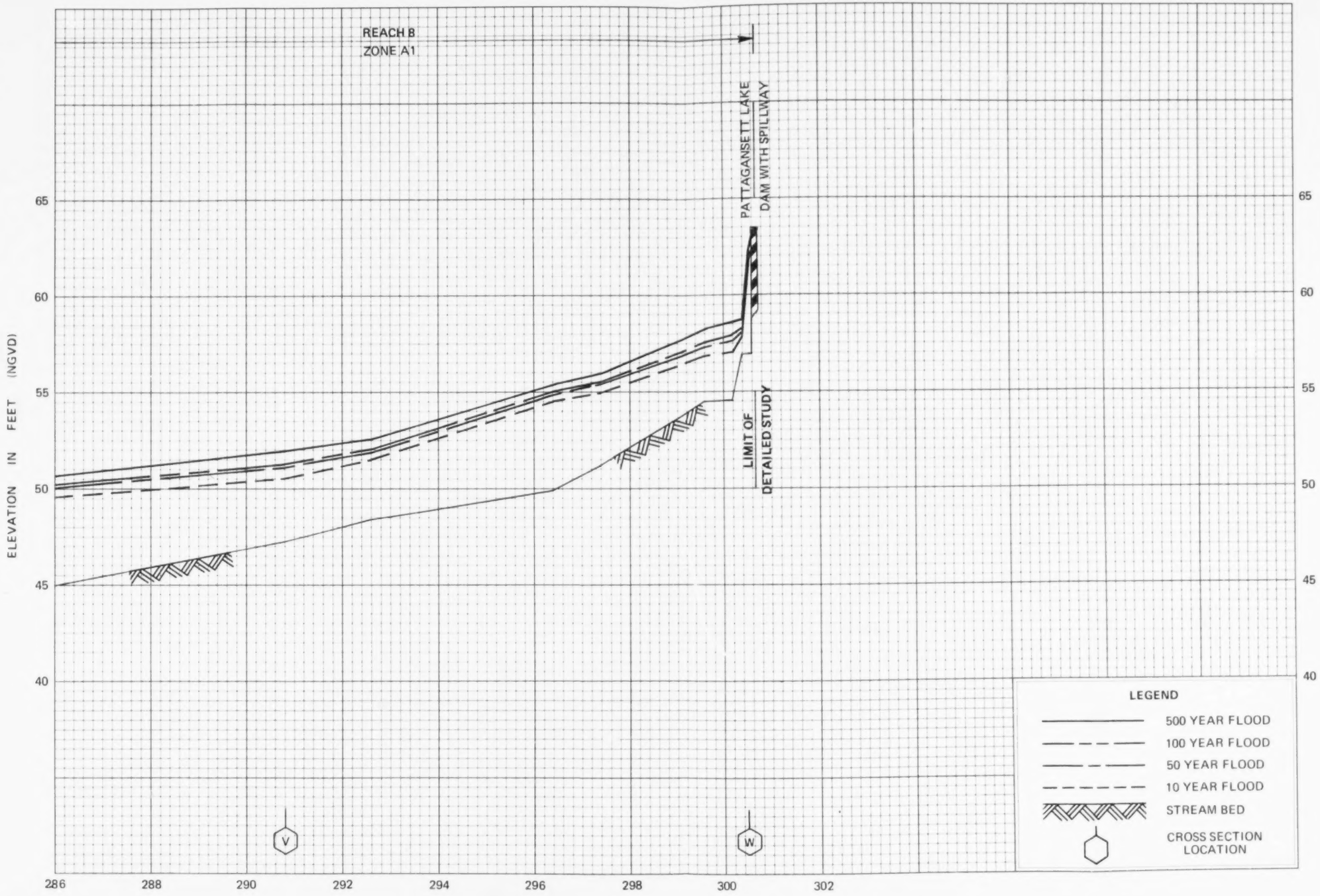
FLOOD PROFILES

PATTAGANSETT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

19P



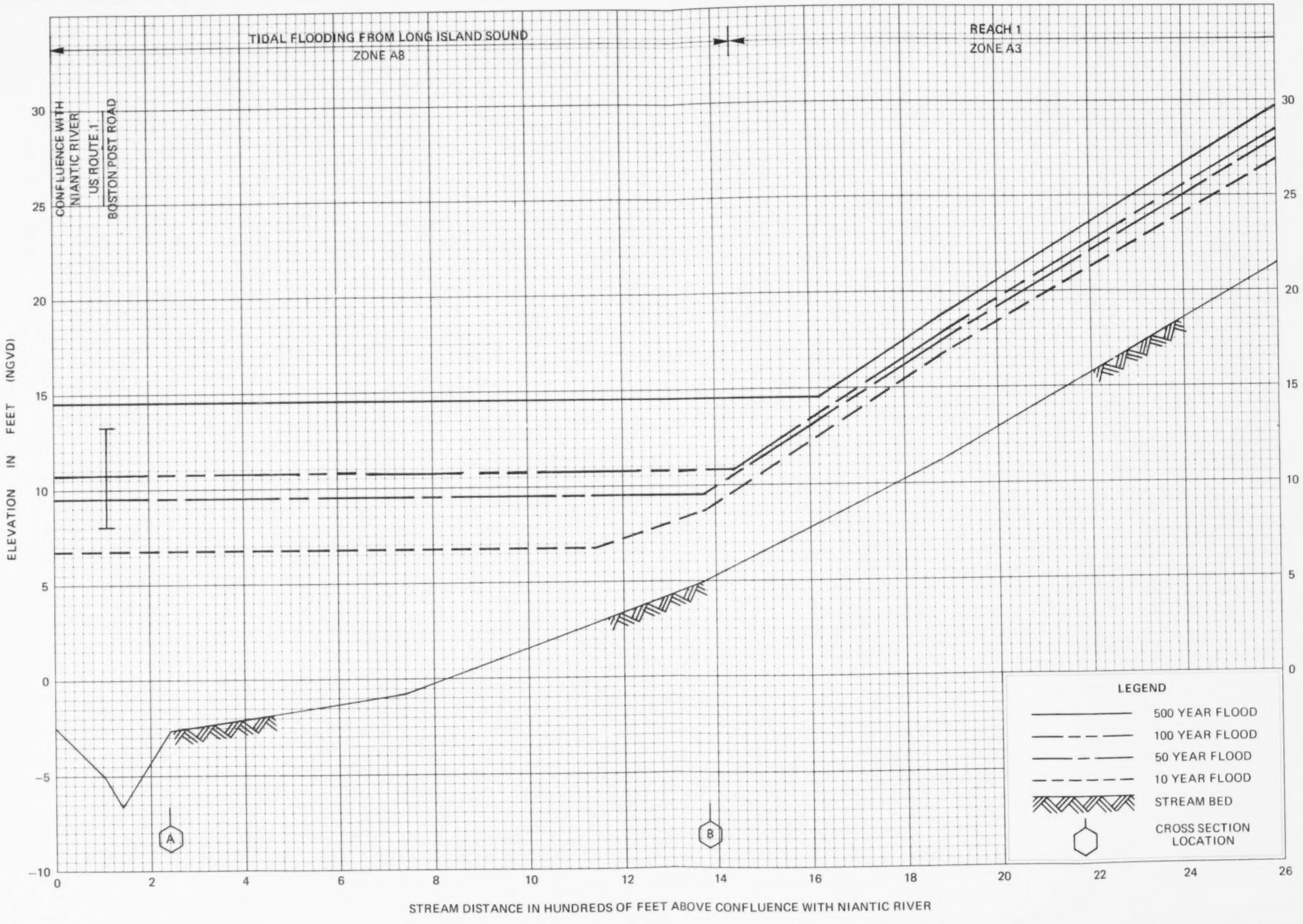
FLOOD PROFILES

PATTAGANSETT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

20P



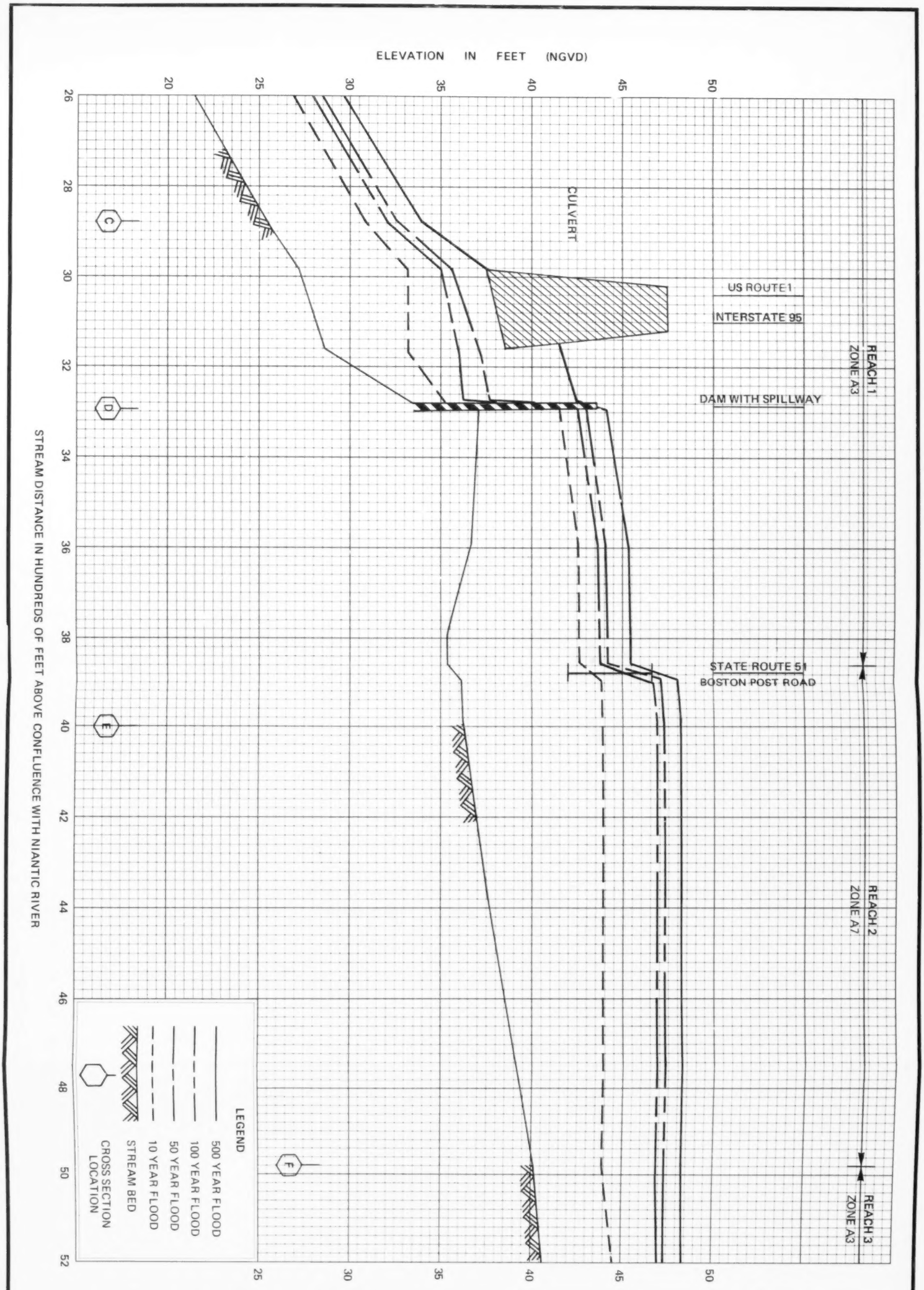
FLOOD PROFILES

LATIMER BROOK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

21P



22P

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TOWN OF EAST LYME, CT
(NEW LONDON CO.)

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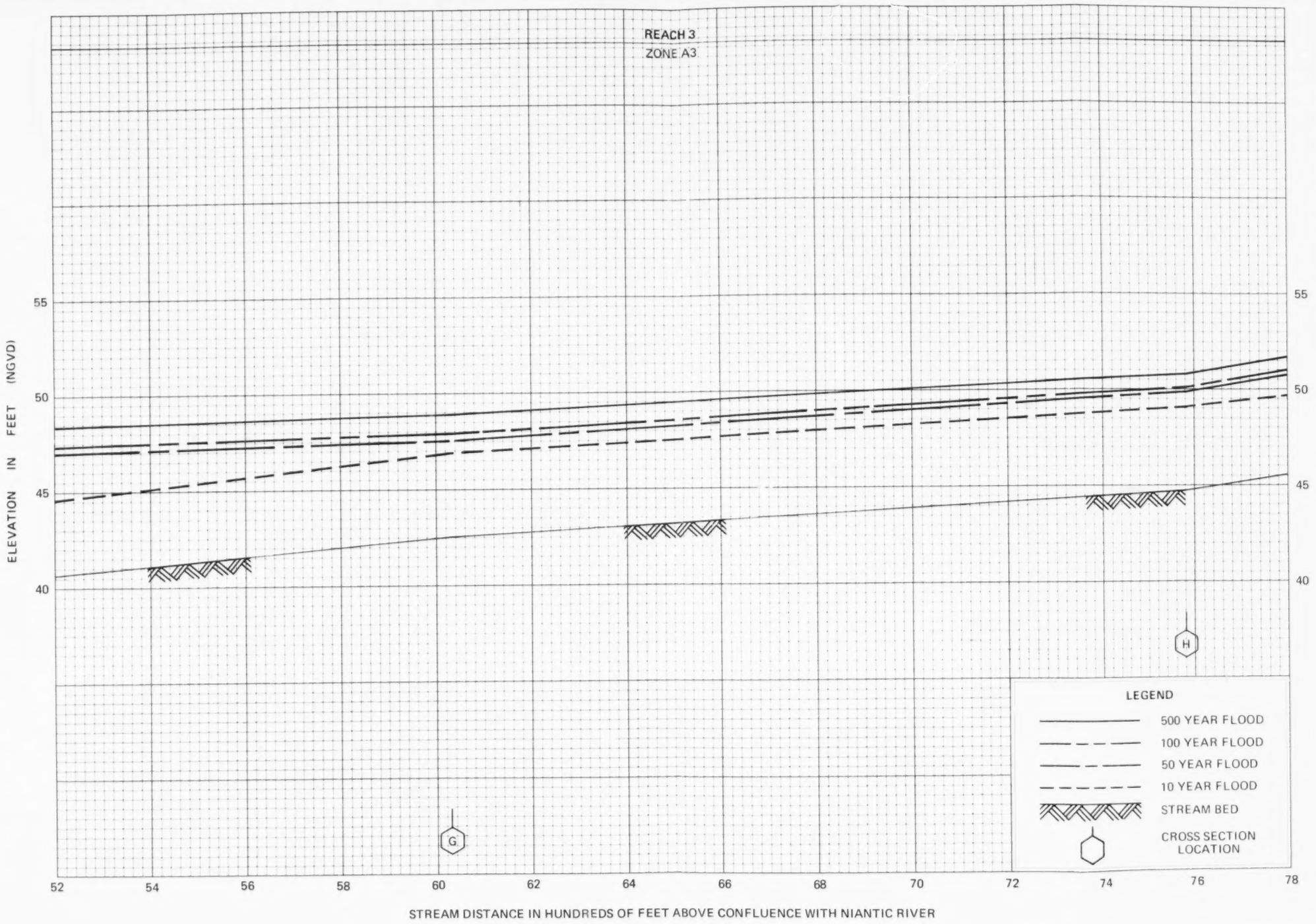

FLOOD PROFILES

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Federal Insurance Administration

TOWN OF EAST LYME, CT
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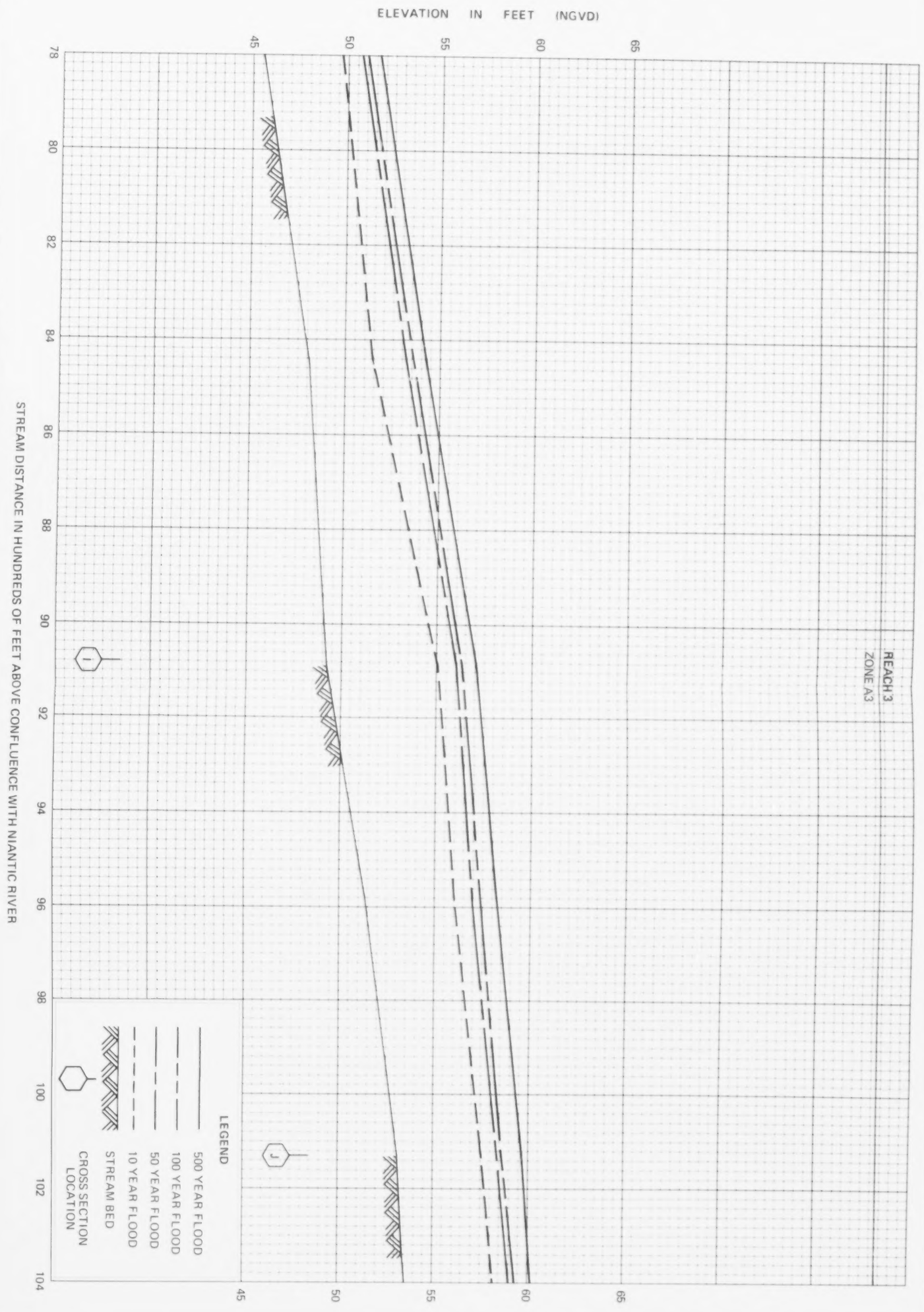
23P



24P

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TOWN OF EAST LYME, CT
(NEW LONDON CO.)

FLOOD PROFILES

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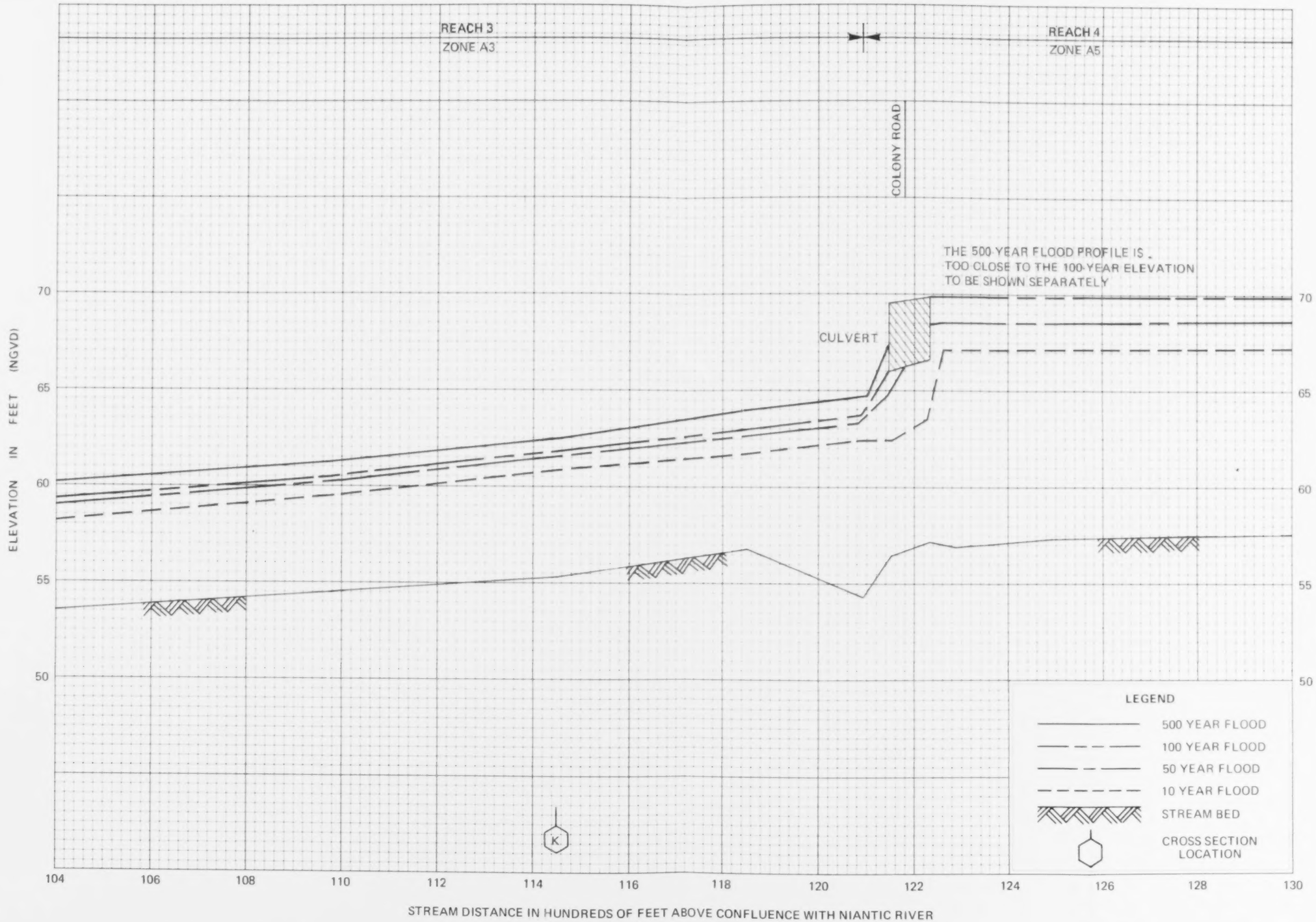

FLOOD PROFILES

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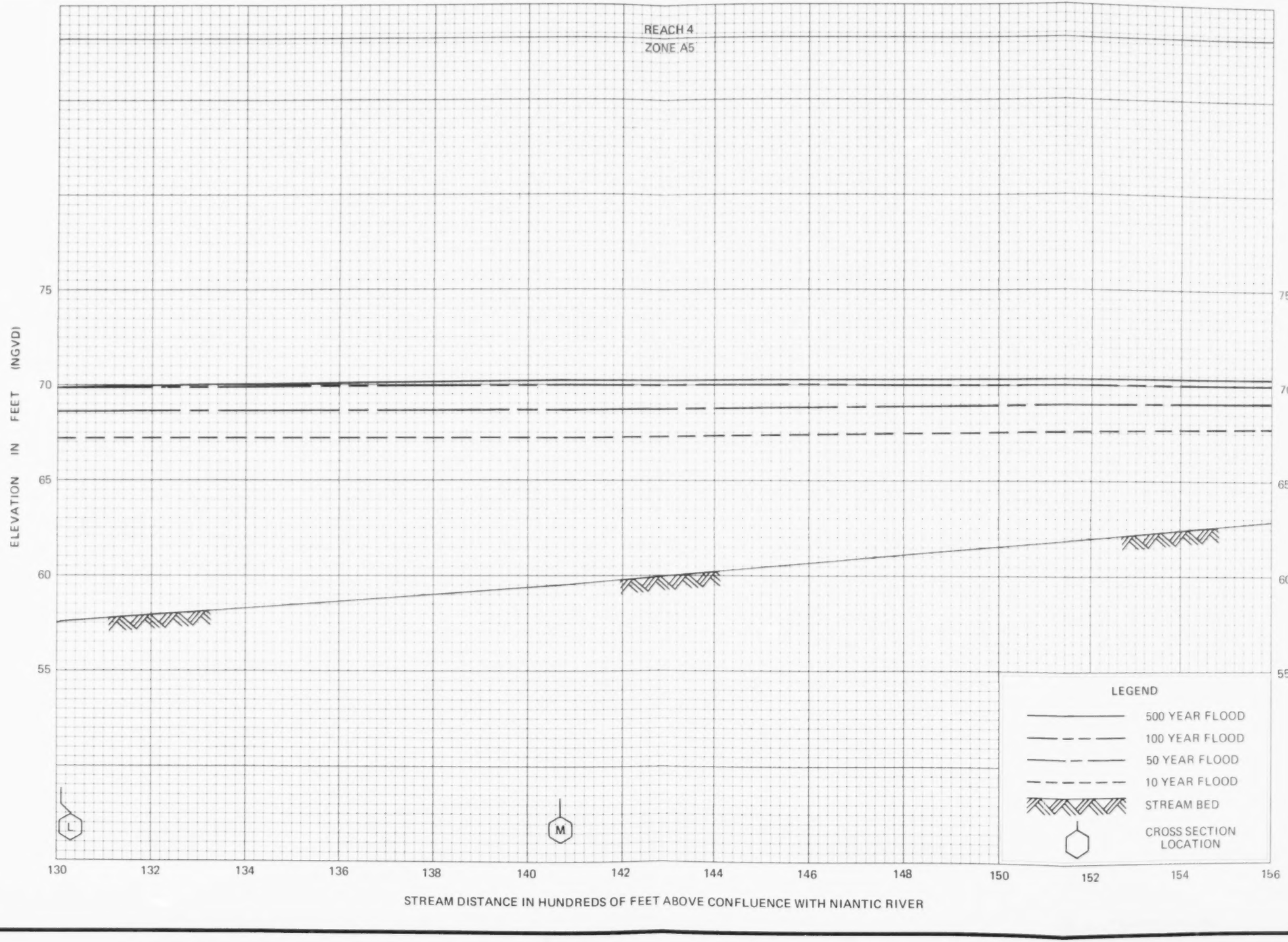
Federal Insurance Administration

TOWN OF EAST LYME, CT
(NEW LONDON CO.)

25P



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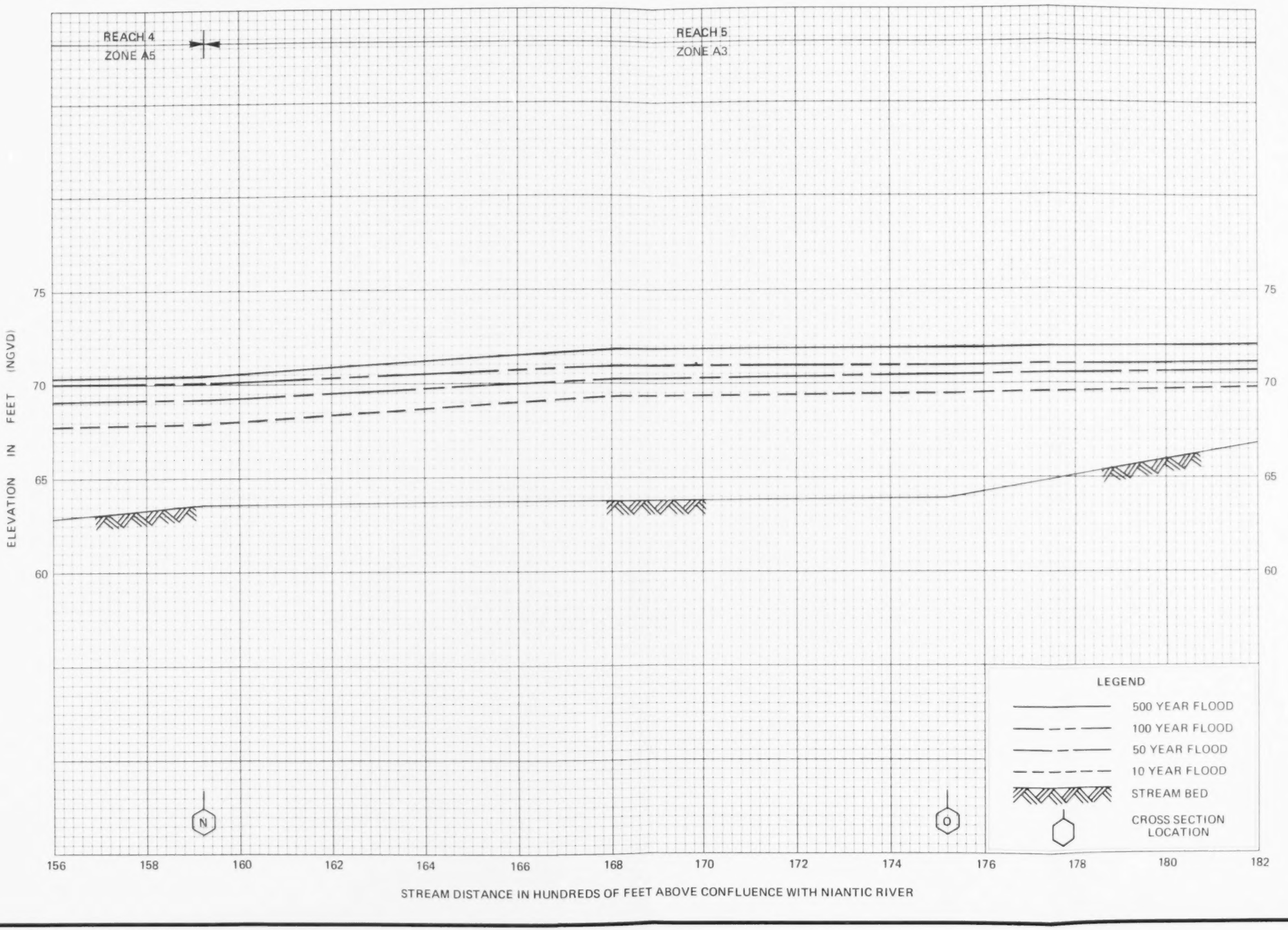
26P



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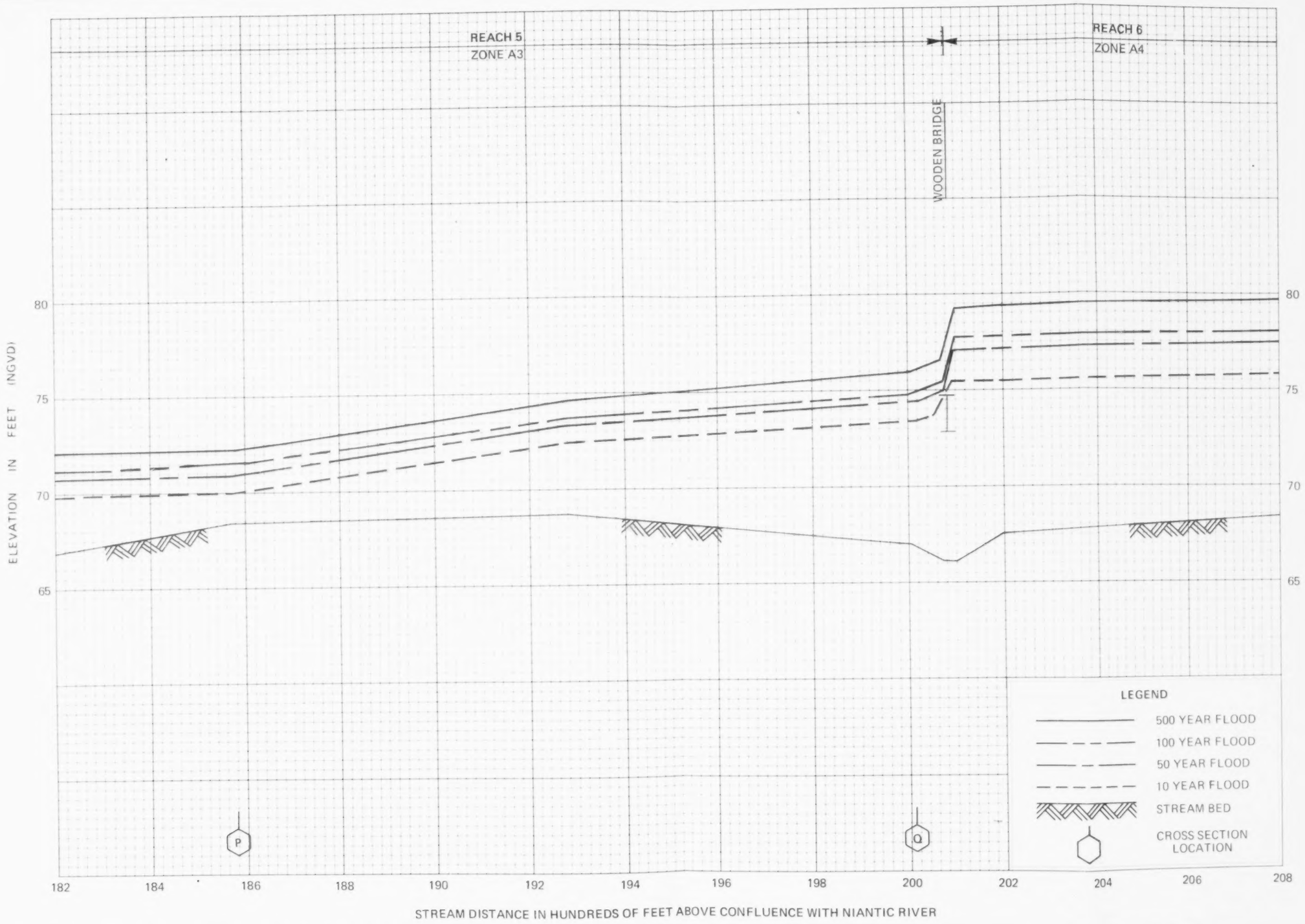
27P



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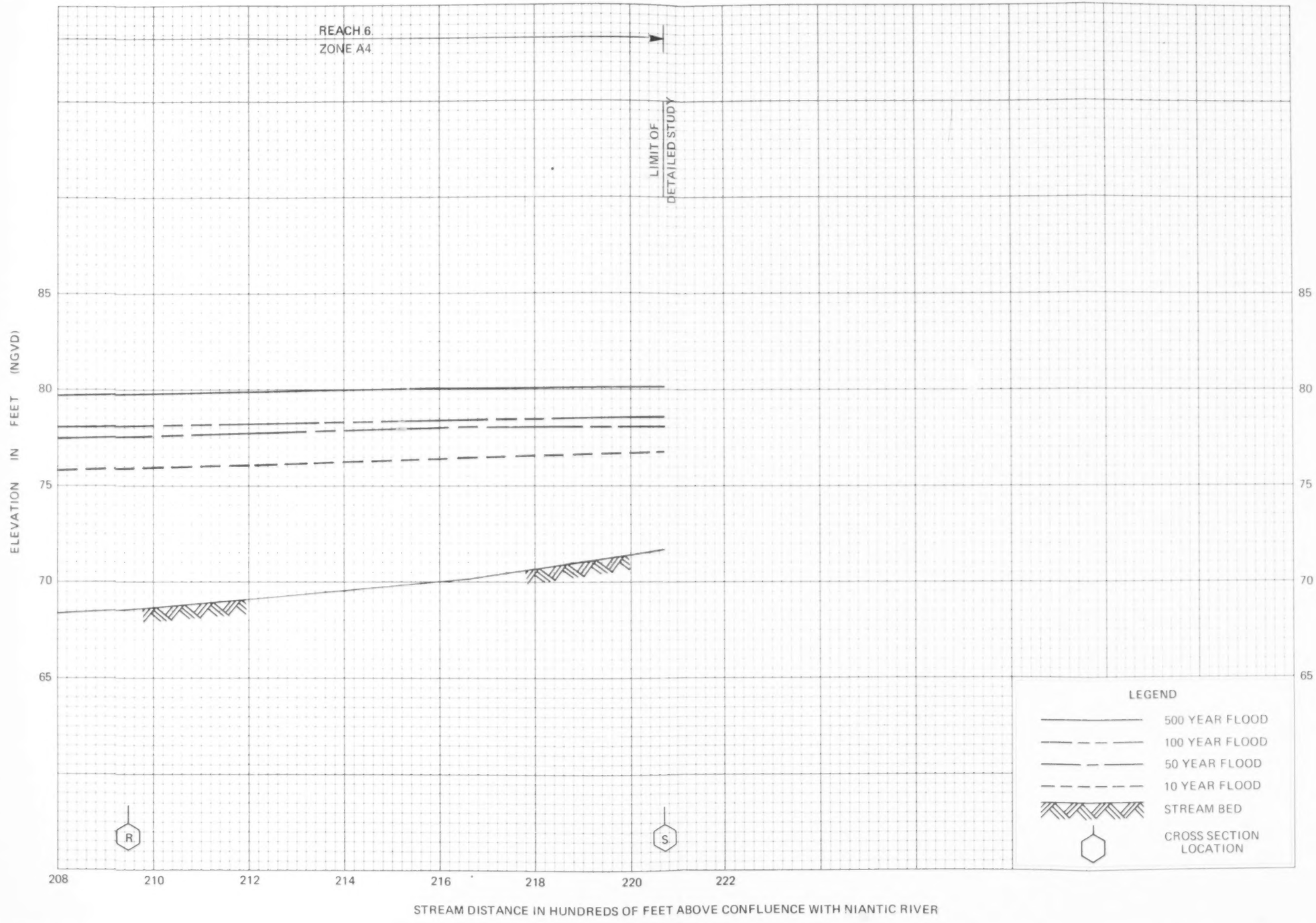
28P



FLOOD PROFILES

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29P